J. H. VAN DEVENTER
President and Editorial Director

C. S. BAUR
Vice-President & General Manager

o o o

Editorial and Advertising Offices
100 East 42nd St., New York 17, N.Y., U.S.A.

O. L. Johnson, Market Research Mgr.
B. H. Hayes, Production Manager.
R. E. Baur, Typography and Layout

o o o

Regional Business Managers

C. H. OBER
New York 17
100 East 42nd St.

H. E. LEONARD
New York 17
100 East 42nd St.

ROBERT F. BLAIR
Cleveland 14
1016 Guardian Bldg.

W. J. FITZGERALD
Pittsburgh 22
428 Park Bldg.

B. L. HERMAN
Philadelphia 39
Chilton Bldg.

H. K. HOTTENSTEIN
Chicago 3
1134 Otis Bldg.

PEIRCE LEWIS
Detroit 2
7310 Woodward Ave.

D. C. WARREN
Hartford 1, Conn.
P. O. Box 81

R. RAYMOND KAY
Los Angeles 28
2420 Cheremoya Ave.

o o o

Owned and Published by
CHILTON COMPANY
(Incorporated)

Executive Offices
Chestnut and 56th Sts.
Philadelphia 39, Pa., U.S.A.

OFFICERS AND DIRECTORS
C. A. MUSSELMAN, *President*

JOS. S. HILDRETH — Vice-President
GEORGE H. GRIFFITHS — Vice-President
EVERIT B. TERHUNE — Vice-President
J. H. VAN DEVENTER — Vice-President
C. S. BAUR — Vice-President
WILLIAM A. BARBER, Treasurer
JOHN BLAIR MOFFETT, Secretary
JULIAN CHASE — THOMAS L. KANE
G. C. BUZBY — P. M. FAHRENDORF
HARRY V. DUFFY — CHARLES J. HEALE

o o o

Member, Audit Bureau of Circulations

Member, Associated Business Papers

o o o

Indexed in the Industrial Arts Index. Published every Thursday. Subscription Price North America, South America and U. S. Possessions, $8; Foreign, $15 a year. Single Copy, 35 cents.

o o o

Cable Address, "Ironage N. Y."

o o o

Copyright, 1944, by Chilton Company (Inc.)

This Week in The IRON AGE

Vol. 153, No. 23 June 8, 1944

Editorial

Transom Business and Ten Percenters 45

o o o

Technical Articles

Alumino-Silicate Refractories 48
Carbide Wear Rings Prowling Core Box Life 53
Forging Ferrous and Non-Ferrous Metals 54
Silver Solder Dispenser 57
Broken Press Frame Casting Redesigned to Welded Steel 58
Sheet Fractures Detected with Supersonics 60
Controlling Machineability of Screw Machine Stock 62
Grinding Lead Screws II 66
Hot Pressing and Sintering of Carbide Powders 71
New Equipment 72

o o o

Features

News Front 47
Assembly Line 76
Washington 80
West Coast 84
Personals and Obituaries 88
Fatigue Cracks 90
Dear Editor 92
This Industrial Week 94
News of Industry 97

o o o

News and Markets

Basic Metals Near Balance 82
Surplus Aircraft Disposal 97
Venezuelan Ore Developments 98
Plant Expansion Continues 99
Steel Wage Hearing 100
Commercial Aspects of Steel Industry 105
British Plan Public Steel Ownership 108
Developments in Rocket Guns 109
Budd Predicts Rail Expansion 116
Machine Tool News 132
Non-Ferrous Metals News and Developments 134
Non-Ferrous Metals Prices; Scrap Prices 135
Iron and Steel Scrap News and Prices 136
Comparison of Prices by Year 138
Finished Iron and Steel Prices 139
NE Steel and Warehouse Prices 140
Semi-Finished and Tool Steel Prices 141
Steel Pipe and Tubing Prices 142
Wire Product Prices 143
Pig Iron and Coke Prices 144
Railroad Material and Stainless Steel Prices 145
Ferroalloy Prices 146

o o o

Index to Advertisers 205

THERE ARE PLACES FOR BOTH . . .

Firth-Sterling, long specialists in making steels for shop tooling, early recognized the possibilities of carbides as a means of extending the improvement in shop practice brought about by the super high-speed steel—CIRCLE C. **But, there is a place for both . . .**

Where the highest speeds are obtainable or materials are hardest, FIRTHITE is the "last word" in a cutting material. It is used at speeds up to ten times those possible with high-speed steels. Where speeds above average are permissible or materials are "on the hard side," CIRCLE C will cut *at least* 25% faster than ordinary grades of high-speed steel. Send for descriptive literature on these remarkable materials.

For instance:

FIRTHITE *removes* 730 pounds of gray-iron casting metal per hour instead of 180 pounds;

drills a gun barrel in 23 minutes instead of 1 hour;

enables milling-cutters to run at 1,000 feet per minute instead of 100 feet with previous materials.

For instance:

CIRCLE C *machines* hard die blocks in 28 hours instead of 42 hours . . . doubling production between grinds — versus regular high-speed steel;

turns two to ten times more pieces of heat-treated alloy steel between grinds than other high-speed steels.

Firth-Sterling
STEEL COMPANY

ARMY-E-NAVY

Offices: McKEESPORT, PA. NEW YORK - HARTFORD - PHILADELPHIA - CLEVELAND - DAYTON - DETROIT - CHICAGO - LOS ANGELES

The
IRON AGE

ESTABLISHED 1855

o o o

June 8, 1944

o o o

J. H. VAN DEVENTER
President and Editorial Director

C. S. BAUR
Vice-President and General Manager

o o o

A. H. DIX
Manager, Reader Service

o o o

Editorial Staff
Editor .....T. W. LIPPERT
Technical Editor.....F. J. OLIVER

o o o

Associate Editors
F. J. WINTERS
T. E. LLOYD
S. H. BARMASEL

Editorial Assistants
M. M. SCHIEN
G. B. WILLIAMS
G. B. ROGERS

Regional News and Technical Editors
T. C. CAMPBELL
Pittsburgh 22
428 Park Bldg.

C. T. POST
Chicago 3
1134 Otis Bldg.

L. W. MOFFETT
DONALD BROWNE
EUGENE HARDY
Washington 4
National Press Bldg.

D. C. MacDONALD
Cleveland 14
1016 Guardian Bldg.

S. H. BRAMS
Detroit 2
7310 Woodward Ave.

OSGOOD MURDOCK
San Francisco 3
1355 Market St

Editorial Correspondents
ROBERT McINTOSH
Cincinnati

C. M. PENLEY
Buffalo

G. FRAZAR
Boston

HUGH SHARP
Milwaukee

F. SANDERSON
Toronto, Ont.

R. RAYMOND KAY
Los Angeles

JOHN C. McCUNE
Birmingham

ROY M. EDMONDS
St. Louis

JAMES DOUGLAS
Seattle

Transom Business and Ten Per Centers

"PA'S rich and Ma doesn't care." That thought has "busted" more promising careers than has most of the causes of failure, that one meets with between the cradle and the grave.

You have heard surely the phrase concerning hard and easy money. Money is always hard for most people to get; easy for some people to spend. People who get their money the hard way usually do not get into bad habits. They can't afford to.

Government gets its money the easy way. Its income is not measured by the values that it creates but by the tax bills that it passes. When it needs more, it demands and gets it, regardless of any thought of economy. Today, when Government income has swelled to astronomical figures, perspectives have been almost obliterated and the thought of economy in expenditures is like the little man who wasn't there. Perhaps that's the way it has to be to win a war.

But this torrential outpouring of easy money that was in the first instance hard money to get has overflowed its legitimate banks and psychologically dampened certain managerial minds in industry and business. The easy money psychosis is not a sound approach to the necessities of the postwar realities which will again demand the hard money concept. That is why I am doing some thinking and talking about transom business and ten per centers.

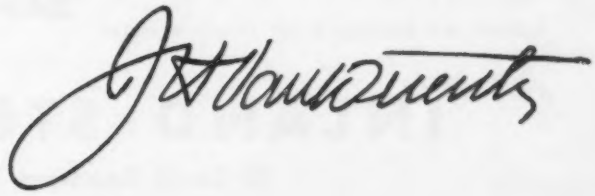
A good many concerns, ourselves included, are today getting business "over the transom" from concerns that we have never dealt with or perhaps even heard of. We like to think that this is the reward of merit afforded a superior product. But there is a possibility that in some measure at least it is "Hobson's choice." Today people will take what they can get and like it.

Transom business is business that you haven't sold. It has been bought by the customer without footwork and personal contact on your part. Of course reputation, advertising and conditions have helped but unless you can put your finger on the predominant factor your sales job in these cases is not finished but only begun. Transoms are not one way openings and business can float out of them as well as in through them.

Sales management today should concentrate on clinching the transom business. Your salesmen have more time to do that today than they will have in the postwar tomorrow.

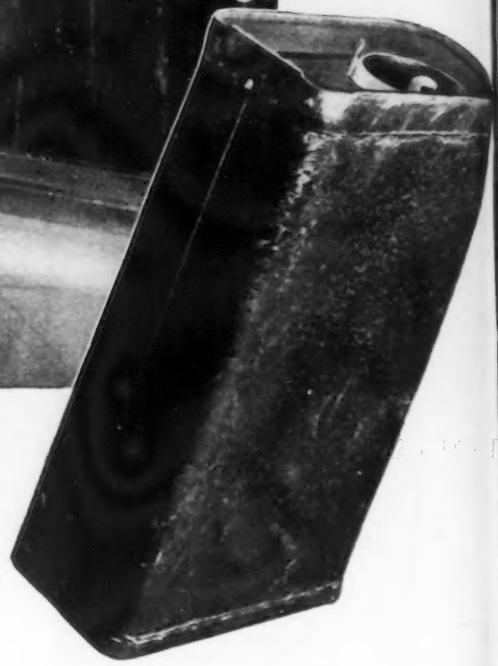
Akin to this and bred by the same extravagant parents is the ten per cent psychosis. It affects some people who are in charge of the spending of company funds when they are in the excess corporate tax bracket. "When we spend a dollar," they say, "it only costs the company ten cents."

Laying aside the thought that excess profit taxes are contributing in a large measure to help win the war and to end it as quickly as possible with the least sacrifice of human lives, there is another angle to consider. When an executive kisses economy goodbye and says: "I have little use for you today," she will return to him when needed only with reluctant feet and after much persuasion. And it will take time to make her believe that he means what he says.



Longitudinal body seams are securely clamped before resistance welding.

Powder boxes must keep a fighting ship's powder dry.



How the Navy Keeps Its Powder Dry

Stored deep in the holds of Allied fighting ships are water-tight boxes—each containing 100 lbs. of powder. These powder boxes must withstand hard usage, stack easily and keep precious powder in condition for instant use by our fighting men. Thousands have been made of Inland hot-rolled pickled and oiled sheets.

They are of welded construction, and galvanized inside and outside for full protection. The opening in the top is sealed with a gasket drawn tight by a hand screw and spider. The bodies are formed from 16-ga. sheets. Tops and bottoms are made of 13-ga. sheets. The tops are formed in four operations—blank and punch opening, deep draw to 2-¾" and emboss opening, trim corners and roll back edges. The excellent working qualities of Inland sheets help speed production and save time and materials.

When Victory is ours, the modern Inland continuous sheet and strip mills, which now are producing at full capacity for the war effort, will again be making sheet and strip for hundreds of peacetime products.

INLAND STEEL COMPANY

38 South Dearborn Street, Chicago 3, Illinois

Cincinnati • Detroit • Kansas City • Milwaukee • New York • St. Louis • St. Paul

News Front

The Iron Age
June 8, 1944

► British trade unionists of the Iron and Steel Trades Confederation have asked for nationalization of the iron and steel industry from the smelting of pig iron up to the manufacture of the finished products of the industry.

► Postwar prosperity has been predicted for the scrap industry by E. C. Barringer. Lasting two to five years, demand for iron and steel scrap will increase after a short reconversion period following the war.

► Development work on Bethlehem hematitle mines in Venezuela has already begun with two million tons of iron ore expected annually at the end of the construction period.

► For the location of intercrystalline fractures parallel to the surface of steel sheets. German metallurgists have turned to supersonic equipment. Supersonic waves on meeting an air cavity are reflected.

If a receiver is arranged on the other side of the sheet being tested, waves will be detected at all points where they have traversed an uninterrupted path.

► Tool orders for the current heavy shell program are about completed, but the volume has not approached the $250 million in orders promised by the military. Machines yet to be ordered include multi-spindle automatics for fuse work and nose threading machines and chasers.

► Makers of industrial power trucks are making experimental models with WPB blessing, so that postwar equipment needs can be estimated.

► The ore industry sees no hope of an OPA move in the direction of increased prices until a decision is reached on the steel wage case.

► The most interesting American fighter plane, which shortly will reach the fighting front, is the Northrup P-61 Black Widow. Details of the plane have been kept quite secret. It's a twin-boom job, which is unusual in that the only other twin-boom plane is the American P-38, and the Germans have ceased production of their twin-boom fighter.

The Black Widow is heavily armed with guns firing both forward and to the rear, is fitted with a tricycle landing gear, and has two Pratt & Whitney motors, presumably of 2200 hp.

► The Boeing B-29 super flying fortress, which has for some time been in full production, has acquired the nickname of the "Tokyo Bomber".

► Eire is building up quite an air force by purchasing interned military aircraft which have been forced down in the Irish Free State. The force consists of a number of British types, some German Heinkels and some American Grummans and Lockheeds.

► "The Wild Sow" is not a new German airplane, which has been reported, but rather a new attack technique. This new method is "attack at any cost", and while it does get some Allied bombers the German pilot losses are severe.

Col. Hermann, Inspector in the German Air Defences, has said that the new attack method has resulted in, "losses of substantial numbers of outstanding, enthusiastic, and highly decorated officers and commanders of air units."

► An extensive plant-to-plant investigation of women in industry, by C. O. Sappington, industrial health consultant of Chicago, produced the conclusion that women can do 80 per cent of the jobs ordinarily performed by men.

Also concluded was that women had earned permanent places in industry.

No outstanding health problems were found among women workers, although they were bothered by small ills and visited plant dispensaries more frequently than men.

► The developer of the jet airplane, Group Captain F. Whittle, has transferred, without payment, the whole of his financial interest in Power Jets, Ltd., to the British Government. He will continue to direct the work of the company.

And: The development of the British jet airplane is being transferred to Canada for extensive experimental work, with emphasis on testing of the jet motors under cold weather conditions.

Alumino-Silicate Refractories

. . . Continuing his series of reports on steel plant refractories, the author, in the first of two articles, describes those having compositions between that of a siliceous fireclay brick (about 20 per cent Al_2O_3) and pure alumina. Their chemical composition, physical structure, properties and world distribution are herein discussed.

o o o

By J. H. CHESTERS

Central Research Department, United Steel Co.'s, Ltd., Stocksbridge, England

o o o

THE mere fact that the term "firebrick" is generally taken to mean a *fireclay* brick, and not any other kind of refractory is a tribute to the unique position held by this class of material. If with fireclay bricks other alumino-silicates varying from pure silica to pure alumina are included, the range of refractories is so comprehensive that it can be used to meet the whole requirements of the acid open hearth furnaces, reheating furnaces and the casting pit.

(1) Clay: Wilson defines clays as, "the weathered products of silicate rocks, containing sufficient hydrosilicate of alumina in the softened condition to produce a plastic or semi-plastic mass when tempered with water." Although this definition is quite adequate for ordinary purposes, clay is now known to be a very much more complex material than was once thought. A big step forward was taken when it was realized that it consisted of a mixture of a mineral known once as "clayite" and various impurities such as mica, feldspar, and quartz. It has since been shown that this "clayite" usually consists of the mineral kaolinite, but that other minerals of similar chemical composition ($Al_2O_3.2SiO_2.2H_2O$) may also be present for example, nacrite and dickite, together with quite different clay minerals of the montmorillonite and illite types. That these materials are not identical with kaolinite (the main constituent in china clay) can readily be shown by comparison of the Debye-Scherrer X-ray photographs.

W. L. Bragg in his book the "Atomic Structure of Minerals" suggests that the exploration of this fascinating field has only just commenced. He states that a general characteristic of the clay minerals is the presence of single sheets of linked tetrahedral (Si-O) groups similar to the double sheets present in the mica type minerals where aluminum or magnesium acts as a bond. The crystals are so small that they are scarcely recognizable even under the most powerful microscope but they can be identified by X-ray "powder" methods. Quite recently, a further advance has been made by the use of the electron microscope.

With magnifications of one hundred thousand diameters the diameter, shape, size and characteristic crystal habit of clays have been studied as is shown very strikingly by the photographs reproduced in Fig. 1. These are taken from a recent paper to the American Ceramic Society by R. C. Humbert of the Department of Agronomy, Ohio State University.

The photographs show that the postulated differences in crystal size and shape of the various clay minerals are very real and that it is in no way surprising that the clays themselves should have different physical properties. A similar examination of bentonite (not shown in Fig. 1) reveals that each unit is composed of aggregates of extremely thin, plate-shaped crystals. The extreme thinness of the plates and the large number of water films, help to explain the high plasticity of this material, while the big surface area is responsible for the high bonding power and high drying shrinkage of bentonitic clays.

Such clays, which fall in the general classification of montmorillonite are principally used as bonds in foundries. They also find considerable application in the steel plant, for example as a bond for such refractories as sillimanite. Montmorillonite and illite (a mica-like mineral) are also found as minor constituents in some fireclays where they serve to increase the plasticity very considerably.

E. A. Hauser in his Edward Orton Memorial Lecture to the American Ceramic Society in 1941 gave a detailed description of the fundamental properties of the clay minerals. He stated that the ultimate clay crystal carries a negative charge either by absorption of anions on its surface, or because of an unbalanced crystal lattice. As a result it has the ability to absorb a certain number of cations to balance its charge. When the clay is suspended in water these will dissociate to a distance which depends on their valence and hydration. The entire clay micelle may, therefore, be compared with a dissociated electrolyte. Just as sodium soap will exchange its sodium for the calcium in hard water so the cation of the clay may be exchanged for another one. This phenomenon, known as "base exchange," although apparently far removed from the every day life of the steel plant, has in fact a direct bearing on such important questions as the workability of cements and the density of fireclay blocks. As Hauser states, "it is a big step from the working out of the properties of all the minerals that may be found in clay to the application of this knowledge in the production of improved refractories, but it is only when this has been done that we shall exchange the present method of working with ill-defined heterogeneous mixtures of

clays and praying that things will go all right for a truly scientific approach."

Fig. 2, taken from a recent paper by Endell, shows a silicon-oxygen layer in a kaolinite crystal. The free valencies at the edges of the layer are shown to have taken up various cations. In kaolin these replaceable basic ions are only present at the external surface but in the montmorillonite clays the magnesium atoms within the lattice can also be replaced and hence a much higher base exchange capacity is possible.

Another aspect in which research on clay has recently made rapid progress is that of the changes which occur when clays are heated. Thus, Jay has X-rayed a number of clays, ranging from the siliceous to the aluminous, after firing in the temperature range 1652 to 2552 deg. F. and has come to the following conclusions:

(a) Quartz in siliceous clays begins to convert to cristobalite at about 2012 deg. F. and is not usually observable on the X-ray pattern after the 2372 deg. F. firing.

(b) Gamma alumina is present at temperatures between 1652 deg. and 1832 deg. F. It is not observed at 2012 deg. F. or over.

(c) Cristobalite is first observed at 2012 deg. F. It is formed, for the most part, from free silica from the dissociated clay rather than from quartz.

$3(Al_2O_3.2SiO_2.2H_2O)$ clay $= 3Al_2O_3.2SiO_2$ mullite $+ 4SiO_2 + 6H_2O$ cristobalite.

At higher temperatures, 2372 deg. to 2552 deg. F., cristobalite tends to disappear with the appearance of a diffused reflection suggestive of glassy material.

(d) Mullite is first observed at 2012 deg. F. There does not appear to be any marked increase in the amount with increasing firing temperature. There is, however, distinct crystal development after the 2552 deg. F firing as indicated by the sharpness of the line pattern, especially for the high order reflections.

The presence of mullite in fireclay brick has been known for a long time but it is only comparatively recently that it was shown by F. A. Harvey and R. E. Birch (in collaboration with N. W. Taylor at Pennsylvania State College) that the mullite was present at a comparatively low temperature and that it was the *size* of the crystals rather than their concentration which increased with the firing temperature. They decided that all the mullite that would form was already present in the specimen after firing to cone II.

For a long time it was thought that the needle-like crystals formed in hard-fired fireclay and porcelain products were the mineral sillimanite ($Al_2O_3.SiO_2$). It is now, however, generally agreed that these crystals are a distinct mineral, mullite, having a composition $3Al_2O_3.2SiO_2$, and so far only discovered in nature in the Island of Mull, Scotland. In ordinary firebricks the crystals are too small to be identified under a microscope but when the bricks have been subjected to slag attack the crystals grow and may be visible even to the naked eye. A thin section through such a slagged crucible is shown in Fig. 3. It is not surprising that the intermeshing of these minute crystals in a fireclay brick should give to it a considerable strength.

(2) Andalusite, Sillimanite, and Kyanite: These minerals which occur in considerable quantities in nature and are all employed as refractories have similar, though far from identical, properties. Their optical characteristics are compared in Table I with those of mullite. The properties

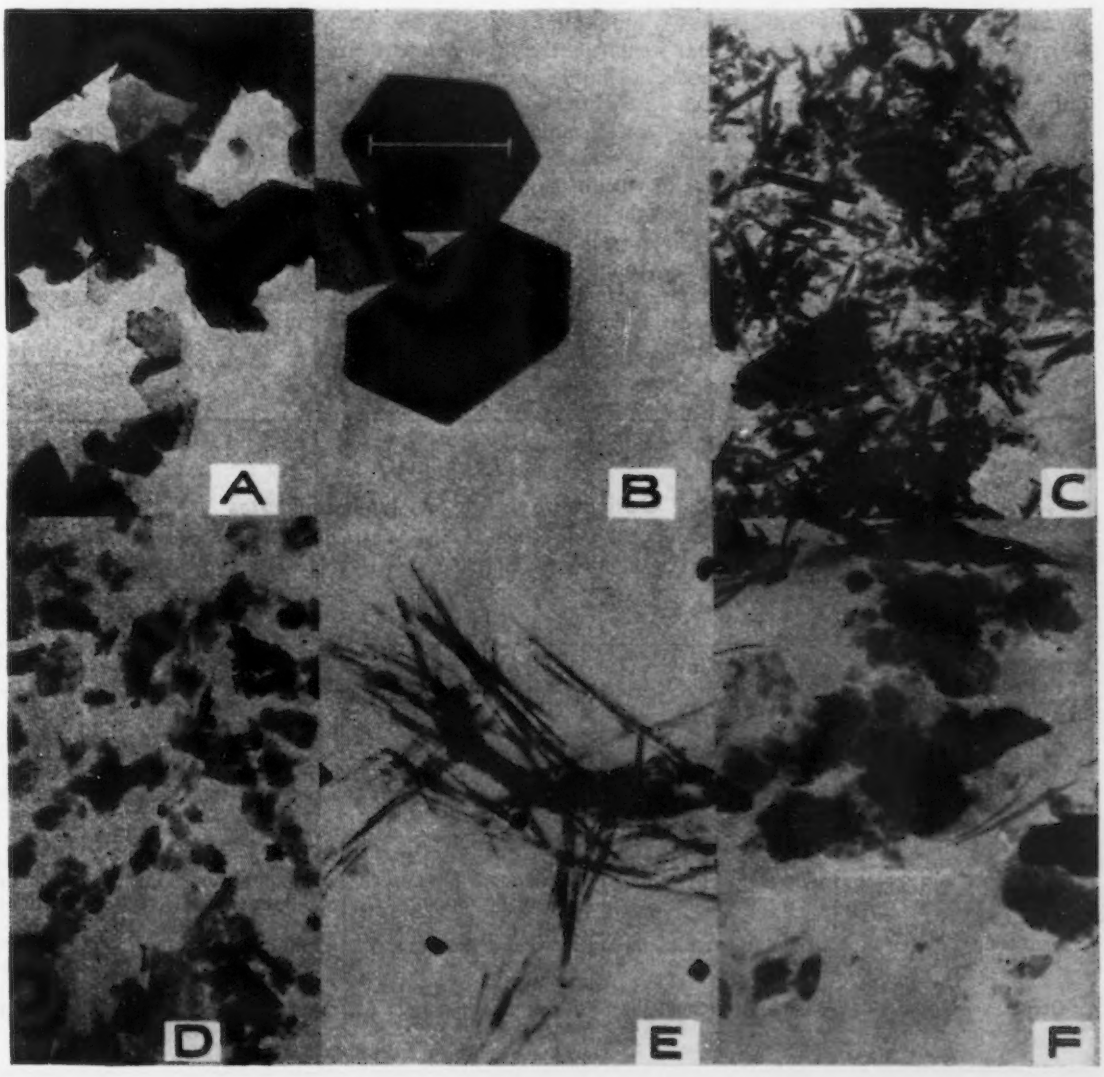


FIG. 1 — Electron microscope photographs of clay minerals of the 1:1 lattice type (after Humbert). A—Kaolinite; B—Dickite; C — Halloysite; D — Sciotoville fireclay; E—Attapulgite; F—Ball Clay. Unit of measurement 1 μ. (1 $\mu = 39.37 \times 10^{-6}$ in.)

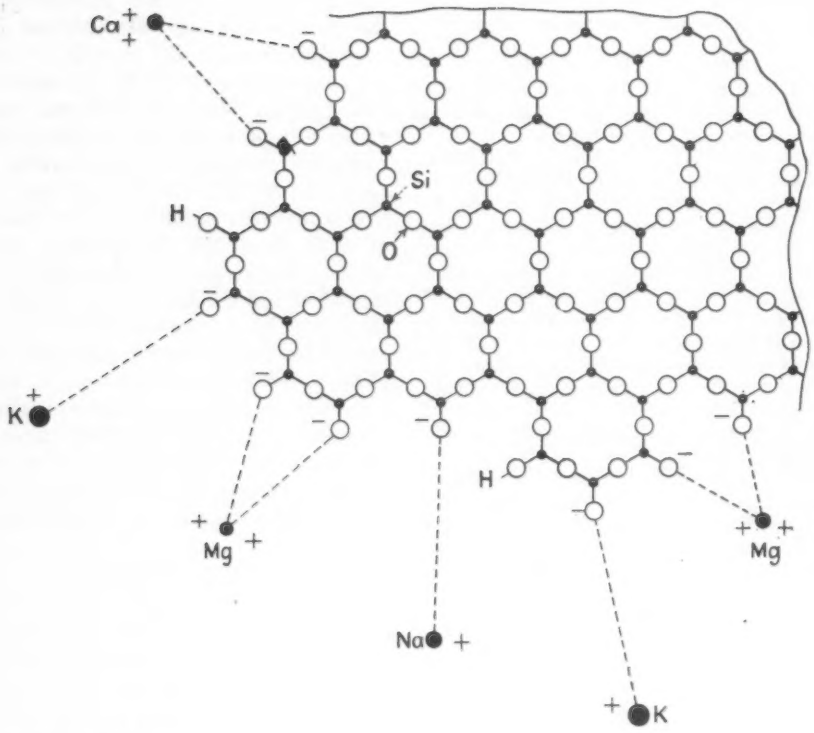


FIG. 2—Edge of a Si-O layer of kaolinite crystal in vertical projection showing cations bound by free valencies (after Endell).

of mullite and sillimanite are so similar that it is not surprising that there has been some confusion when only poorly developed crystals (often embedded in glass) could be compared. All three of these very refractory alumino-silicates break down on heating to give mullite and excess silica.

(3) Corundum (Al_2O_3): The other important mineral in the present series is corundum. It is formed when precipitated alumina or various aluminium salts were heated to a sufficiently high temperature. It has a higher refractive index (1.759 to 1.767) than the above minerals, is colorless and usually occurs as euhedral crystals. It has a weak birefringence with a maximum interference color of the second order and extinguishes parallel to the crystal outline. It is found in nature but most of the corundum used in refractories is formed by electrical fusion of bauxite, a rock consisting essentially of hydrated alumina minerals. Diaspore ($Al_2O_3.H_2O$) is also used for increasing the alumina content of alumino-silicate refractories.

Reactions With Other Oxides

Al_2O_3-SiO_2: This system, (Fig. 4), which was first worked out by Bowen and Greig, provides fundamental data on the whole range of alumino-silicate refractories. In particular, it shows the general influence of composition on melting point. Thus, bricks of approximately 100 per cent silica content should have a melting point of about 3092 deg. F. but even a small addition (5 per cent) of alumina will result in a serious drop in refractoriness. Beyond this the refractoriness will tend to increase again with the alumina content. It should, however, be pointed out that fireclay bricks are not equilibrium products in the alumina-silica system and that, quite apart from the presence of impurities, other factors such as the firing treatment must be considered.

Two instances will suffice to show the danger of rash generalizations on the basis of the alumina-silica diagram; the first is the acid induction furnace where china clay added to calcined ganister gives a much more durable (and quite refractory) patch than straight ganister. The other is the acid bessemer where an addition of 10 per cent of quartz to 40 per cent alumina tuyeres was found to give improved life. In both cases even the slagged product is far from equilibrium, the reaction products containing large pieces of quartz that have not even had time to convert to cristobalite. In such cases, the problem

TABLE I

Optical Properties of Alumino-Silicates

(Data abstracted from "Thin Section Mineralogy", Rogers and Kerr, McGraw Hill Book Co., Inc., 1933)

	Mullite	Andalusite	Sillimanite	Kyanite
Formula	$3Al_2O_3.2SiO_2$	$Al_2O_3.SiO_2$	$Al_2O_3.SiO_2$	$Al_2O_3.SiO_2$
Refractive indices	1.642 to 1.654	1.632 to 1.643	1.659 to 1.680	1.712 to 1.728
2V (axial angle)	45 to 50 deg.	84 deg.	20 deg.	82 deg.
Optic sign	+	−	+	−
Color	colorless	usually colorless	colorless	colorless to pale blue
Form	Long prismatic habit with nearly square cross-section	Euhedral crystals or course columnar aggregates. Cross-section nearly square.	Slender prismatic crystals—felted mass of fibers.	Broad elongated plates—tabular parallel to 100.
Birefringence	Moderate. First order yellow, maximum.	Moderate. First order yellow, maximum.	Rather strong. Up to 2nd order blue.	Moderate. Up to 1st order red.
Extinction	Parallel to longitudinal sections.	Parallel in most sections.	Parallel	On 100 is about 30 deg. with length of crystals.
Occurrence	Island of Mull Scotland.	A common mineral.	In metamorphic rocks.	In metamorphic rocks.

is rather one of two refractories—fireclay and silica—being used side by side.

(5) **FeO-Al_2O_3-SiO^2:** Information on the fundamental reactions of fireclay bricks with other oxides, notably FeO and MnO, in the steelworks, has been greatly enhanced by two recent papers, the first by Snow and McCaughey, and the second by Snow. Still more recently Schairer has considered this system as part of a wider study of the quaternary CaO-FeO-Al_2O_3-SiO_2. The equilibrium diagrams which they have worked out are shown in Figs. 5 to 8. From the first two of these figures it will be seen that the addition of iron oxide even to the amount of only 30 per cent reduces the melting point of a high grade fireclay material to as low as 2192 deg. F. Further additions result in a drop to as low as 1778 deg. F. a slag which is likely to be very fluid at working temperature.

Those who have had experience of millscale on fireclay or even sillimanite hearths operating at temperatures of 2192 deg. to 2552 deg. F. will know how serious this reaction can be. It is interesting to note that no ternary compound is reported in this system although two are reported in the corresponding system containing manganous oxide. The only binary compounds which have been found are the spinel hercynite $FeO.Al_2O_3$, fayalite ($2FeO.SiO_2$), and mullite. The diagram is particularly valuable as it shows that only a slight improvement in resistance to FeO attack is likely to occur with a small increase in the alumina content of a fireclay brick. With much higher alumina contents, approaching that of Al_2O_3 itself, much increased resistance, almost comparable with that of magnesia, is obtained.

o o o

FIG. 3 — Mullite needles formed by melting iron with additions of manganese and aluminum in a fireclay crucible.

o o o

(6) **MnO-$Al_2O_3SiO_2$:** This system is in many ways similar to that of the corresponding system containing FeO, the low melting point region occurring in approximately the same part of the diagram. Two ternary compounds $3MnO.Al_2O_3.3SiO_2$ (spessartite) and $2MnO.2Al_2O_3.5SiO_2$ have, however, been found. The first of these is a member of the Garnett family and was previously known in nature but the second does not appear to have been noted except in these synthetic melts.

As with the FeO diagram, any increase in alumina above the clay composition results in an increased resistance to MnO, but the rate of rise is slow compared with that at which the price of the refractory increases. It is not surprising, therefore, that sillimanite, which undoubtedly has a higher resistance to attack by FeO and MnO rich slags than the ordinary fireclay brick, has not met with any wide application in steel plants.

(7) **$CaO.Al_2O_3.SiO_2$:** This system, which was first worked out by Rankin and Wright, and later modified by

TABLE II

Properties of Selected American Alumino-Silicate Refractories

(Data by F. A. Harvey)

	Intermediate Heat Duty	High Heat Duty	Super Duty Regular	Kaolin	50 Per Cent Alumina	60 Per Cent Alumina	70 Per Cent Alumina	80 Per Cent Alumina
Silica content, per cent	60	53	52	53.5	46	36	22	.....
Alumina content, per cent	35	42	43	43	50	58	72	.....
P. C. equivalent	30–31	32.5	33–34	33–34	35	36–37	38	.....
Approximate deg. F.	3029	3133	3184	3184	3241	3299	3335	.....
Density (bulk) . grams per cc.	2.114	2.082	2.323	2.082	2.339	2.178	2.082	2.659
Porosity, per cent	18	18	14	21	16	25	35	23
Spalling loss—per cent:								
High duty schedule	.....	7.5	0	.....	.....	.....	.....	.....
Low duty schedule	.....	.....	2.7	2	2	1	.....	0
Reheat Test—Change—Linear								
5 hr. at 2552 deg. F.	−0.5	±0.5	.....	.....	.....	.....	.....	.....
2912 deg. F.	.....	.....	−0.2	−0.7	0.5	0.1	±0.6	0
3002 deg. F.	.....	.....	.....	−2.7	.....	−0.4	.....	1.0
Load Test—25 lb. per sq. in. for								
1½ hr. per cent subsidence:								
at 2372 deg. F.	3.0	.....	.....	.....	.....	.....	.....	.....
at 2462 deg. F.	.....	5.0	3.0	.....	.....	.....	.....	0.1
at 2642 deg. F.	.....	.....	5.0	1.0	4.0	.....	.....	.....

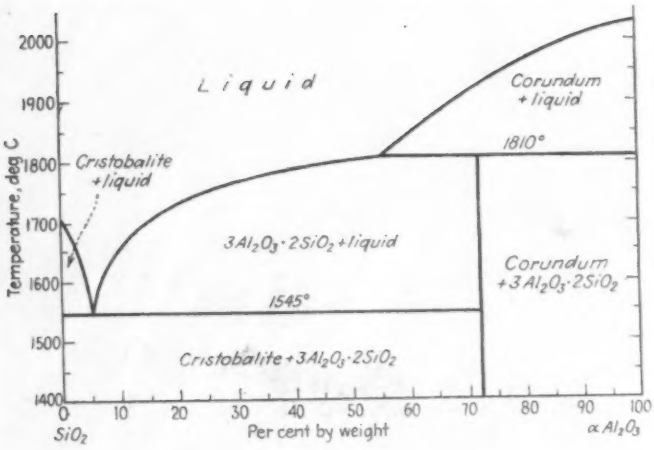


FIG. 4 — Alumino-Silica system showing the general influence of composition on melting point. Fireclay bricks, however, are not equilibrium products and therefore other factors such as firing treatment must be considered (from Bowen and Greig).

Bowen and Greig, is principally of interest in connection with blast furnace work. It shows that here again no great improvement in performance can be expected by a small increase in the alumina content above the ratio present in kaolin. It is doubtless of importance also in connection with basic open hearth slags but here the reactions are complicated by the presence of a number of other oxides.

(8) MgO-Al_2O_3-SiO_2: This system is of direct interest to the steel plant since it explains why the use of magnesite brick in contact with fireclay brick at a high temperature leads to serious fluxing. It has been suggested that cordierite ($2MgO.2Al_2O_3.5SiO_2$) could be used as a bond for casting pit refractories and would increase their thermal shock resistance. That it does so is shown by the good results obtained by adding talc to pottery saggers. The idea has not, however, been adopted for steel works, presumably because of the resulting drop in refractoriness of the product.

A great deal more work is required before the reactions of alumina-silica refractories with other oxides can be predicted, even for equilibrium conditions. In particular the quaternary diagram FeO-MnO-Al_2O_3-SiO_2 requires working out and the quinternary formed by these oxides with lime. Given this information a more fundamental approach would be available to many steel plant problems.

Raw Materials

Fireclays suitable for use in the manufacture of refractory bricks are widely scattered throughout the states. In particular they are found and mined in Illinois, Indiana, Kentucky, Maryland, Missouri, Ohio and Pennsylvania. They are often associated with coal measures and may be of the plastic type or the so-called flint clays which get their name from their characteristic structure and appearance. Clays are also mined for refractory purposes in New Jersey, Texas, Mississippi, California, Washington and Colorado. In the Ozark region of Missouri clays varying from normal up to those as high in alumina as diaspore are found and these are of particular value in the manufacture of highly refractory bricks.

In Great Britain the clays are also well distributed and factories manufacturing such products are found in England, Scotland and Wales. The most refractory products come from Scotland and to a less extent from Cornwall in the form of china clay products. Clays with a refractoriness as high as 3146 deg. to 3182 deg. F.

From the users' standpoint the clays can be roughly divided into three groups according to their alumina content. The normal fireclay brick has an alumina content of between 33 and 38 per cent, but siliceous bricks with as low as 22 per cent alumina are used. The best Scotch firebrick and the high duty and super duty firebricks used in America have a much higher alumina content and a correspondingly higher refractoriness. In Great Britain, relatively few bricks are manufactured in the range between 42 per cent alumina and the 60 to 70 per cent alumina "sillimanite" refractories. In America, however, the existence of the diaspore clays enables a continuous range of products to be made. Although the initial selection of a refractory clay is generally made on the basis of chemical analysis or refractoriness,

TABLE III

Properties of Selected British Alumino-Silicate Bricks

TYPE CODE	Siliceous F. 45	Medium Alumina F. 41	Kaolin F. 16	42 Per Cent Alumina F. 22	Sillimanite (62 Per Cent A1203) F. 14	70 Per Cent Alumina X. 15	95 Per Cent Alumina F. 7
Apparent porosity, per cent	30.6	19.4	24.0	16.4	23.8	24.9	26.2
Bulk density gram per cc.	1.85	2.08	2.00	2.08	2.33	2.62	2.90
Apparent specific gravity	2.67	2.59	2.63	2.48	3.06	3.48	3.93
Cold crushing strength—lb. per sq. in. Full brick on end	1940	2500	4890	6050	3380	Over 8300	7380
Permeability—perpendicular to 9 in. x 3 in. face—1 skin-cgs. units	0.011	0.028	0.063	0.071	0.005	0.023	0.011
Linear change on firing:							
2h—2570 deg. F.	6.5 exp.	0.0	0.0	0.3 exp.			
2h—2732 deg. F.					0.1 exp.	0.2 Sh.	0.3 Sh.
Melting point deg. F.	2876	3092		3182			
Refractoriness—underload—50 lb. per sq. in. rising temperature:							
Initial deformation	1150	1500	1340	1300	1500	1560	1340
Rapid deformation	1270	1550	1570	1540	1580	1580	1560
Shear or 10 per cent collapse	1410	1600	1630	1610	1760	1690	1700
Thermal shock resistance	4	30+	30+	30+	30+	30+	30+

other properties are, of course, important, for example, plasticity, drying shrinkage, firing shrinkage, and after contraction on the fired bricks. The desired state is often achieved by mixing a number of clays. Thus, in America the flint clays and the plastic clays are employed together with a certain amount of pre-calcined clay or brick as the so-called "grog." The amount of grog added varies according to the process from 0 to 90 per cent or over but is in general between 10 and 25 per cent of the total batch weight.

The principal impurities in ordinary fireclay are silica (as raw quartz) and iron oxide. The presence of silica in excess of that required for the kaolinite ratio has a lowering effect on the ultimate refractoriness but much more important is the effect of iron oxide, a few per cent of which may lower the melting point by 68 deg. or 86 deg. F. Other impurities such as titanium oxide, lime and magnesia have less marked effects. Alkalies, on the other hand, are very important. They are generally present to the extent of less than 1 per cent but clays with as recent high as 7 per cent of alkalies are known and must be avoided for refractory purposes. The specific effect of the alkali content will be discussed in more detail later in this article, as will also the effect of carbonaceous material.

Andalusite is principally found in America at White Mountain, Cal., but is also mined to a lesser extent in Nevada.

Sillimanite is principally found in the large deposits in the Khasi Hills in Assam and at Pipra, Rewa in India. These deposits are rather inaccessible and as yet are relatively undeveloped but will doubtless yield increasing quantities of sillimanite as the demand increases.

Kyanite also occurs in commercial quantities, principally in North Carolina. It is also found in Imperial County, Cal., and in considerable amounts in India. The development of kyanite refractories and the use of topaz as an alternative material is fully discussed in a recent article by McVay and Wilson. (See bibliography.)

Corundum is mined to some extent but the greater part of the alumina used for high alumina refractories comes from the calcination or electrical fusion of two hydrated alumina minerals: Bauxite and diaspore. Although bauxite is found all over the world the important deposits are mainly in the hands of Russia, France, United States, Dutch Guiana, British Guiana, Hungary, Italy and Yugoslavia. Minor quantities are found in other countries for example in Greece and in Northern Ireland. This peculiar distribution is, however, more important to the aluminium industry since the refractory trade can draw on the diaspore deposit of Missouri both for the manufacture of bricks and cements.

Editor's Note: The discussion is concluded next week with a description of the manufacture, properties and application of alumino-silicate refractories.

Previous articles by J. H. Chesters on steel plant refractories, that have appeared in THE IRON AGE are:

"All-Basic Open Hearth Furnaces," Aug. 15 and 22, 1940.
"Steel Plant Refractories," Feb. 6 and 13, 1941.
"Basic Open Hearth Above Sill Plate Level," May 22 and 29, 1941.
"Basic Open Hearth," Aug. 7, 14 and 21, 1941.
"Casting Pit Refractories," Nov. 20 and 27, 1941.
"Electric Steel Plant Refractories," March 5 and 12, 1942.
"Acid Open Hearth Refractories," May 28 and June 4, 1942.
"Soaking Pit and Reheating Furnace Refractories," July 16 and 23, 1942.
"Acid and Basic Bessemer Refractories," Nov. 5 and 12, 1942.
"Silica and Semi-Silica Refractories," Jan. 21 and 28, 1943.
"Magnesite Refractories," June 3 and 10, 1943.
"Dolomite Refractories," Aug. 5 and 12, 1943.
"Chrome Ore and Chrome Magnesite," Nov. 11 and 18, 1943.

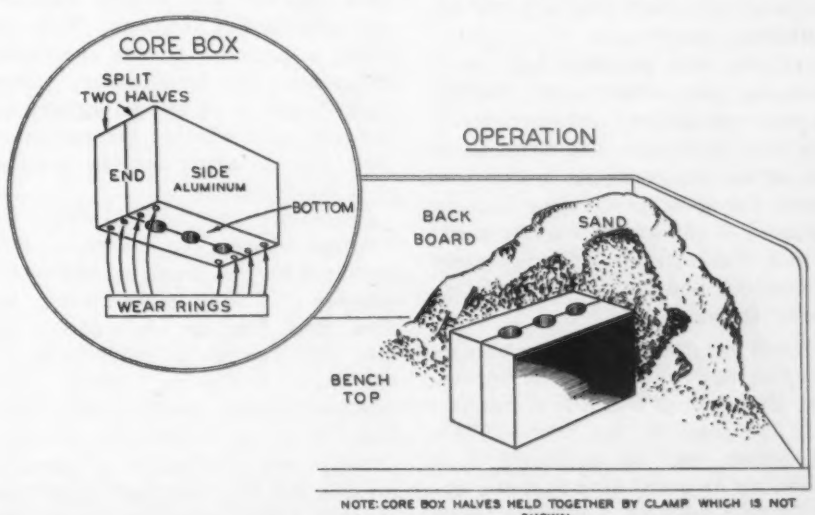
Carbide Wear Rings Prolong Core Box Life

A RECENT example of the savings which can be effected by the substitution of a small amount of tungsten carbide for other materials exposed to wear (caused by rubbing or abrasion) comes from an Ohio foundry. Here, aluminum core boxes—made in halves and held together by clamps—are used. (See accompanying sketch.) After a box has been filled with core sand and sand is rammed down into the box, the box is rubbed over the bench top to smooth off the bottom.

The rubbing over the bench top covered with highly abrasive core sand wore away the bottom of the boxes unevenly. This put such a strain on the dowel pins used to line up the two halves of the core box that in time the box had to be scrapped or overhauled, the life of the average aluminum core box being only about 1500 cores.

The foundry secured from Carboloy Co., Inc., some cemented carbide fishpole guide rings originally made to withstand the wearing action of fishing wire or fishline. These rings were attached to the bottoms of the core boxes so that the hard abrasion-resisting rings, rather than the comparatively soft aluminum take the brunt when the boxes are slid along.

The result has been a big saving in time previously lost while repairing the boxes or making new ones, since the carbide wear-proofed boxes produce 9000 or more cores before overhauling becomes necessary



New Developments in Forging

By R. W. THOMPSON
Sales Engineer, Transue & Williams Steel Forging Corp.

FORGING an aluminum alloy propeller. This is a closed die, with excess metal being forced out into the gutter surrounding the die impression.

RECOGNITION by Army, Navy and Aircraft engineers of the necessity of using forgings for parts which must withstand terrific stresses has acquainted many manufacturers with their qualities and advantages. Government contracts specifying drop forgings have made necessary the purchase of forgings by many contractors and sub-contractors who previously had little or no idea of the processing or facilities required for their production. For the guidance of these new users it might be well to explain the different classes of forgings and the methods of producing them.

Closed die forgings or die production forgings are produced in impression dies, each of which is a commercial duplicate of the other. Their fabrication may be conducted in a steam, air or board drop hammer, upset forging machine, forging press or a combination of any of these for the production of the intricate or more complex designs.

Closed die forgings produced by hammering in a steam, air or board drop hammer are further classified and termed drop forgings. When the metal is displaced by the application of pressure the forgings are termed upset forgings or press forgings, depending upon whether the equipment used was an upset forging machine or a forging press.

There are many applications for forgings wherein the quantities to be produced are too small to justify the expense of sinking impressions in the dies. Such forgings are made on flat dies with the use of hand tools and are known as flat die forgings, plain hammer forgings or blacksmith forgings. Forgings in this class are produced in steam hammers or hydraulic presses and are only rough duplicates of each other, requiring greater dimensional tolerances and more machining than do closed die forgings. In addition to the production of small quantity lots as flat die forgings, this method is used both for parts which are of such shape that closed dies are impractical and also for the production of large and extremely heavy forgings.

The hammer equipment for producing flat die forgings while having the same general principle of operation is designed so as to give a wide working area which is necessary for this class of production. The hammers are of the double frame or single frame type and will produce forgings weighing several tons. The presses are generally used for extremely heavy forgings, cogging down ingots, production of die blocks, large gun barrels, marine engine crankshafts, etc.

In designing parts for a closed die forging, the engineer is cautioned to utilize the inherent grain fibers in the metal to assist in developing the highest physical properties. Adequate filets, ample radii and sufficient draft angles are essential for a high rate of forging production and for prolonging die life. These details of design help to relieve one of the major bottlenecks in the forging industry by reducing the frequency of re-working dies. Also these good designing features tend to decrease the cost of forgings.

The selection of a method for producing closed die forgings is usually a matter for the decision of the forging engineer. The type of metal, shape and weight of the part and the available equipment are carefully considered in the selection of the forging process. There are cases where the same part is produced as a press forging in one forge shop and as a board or steam hammer forging in

Ferrous and Non-Ferrous Metals

. . . The rapid rise in the use of both ferrous and non-ferrous forgings has resulted in many new production problems. As a guide to these new comers in this field, the author explains the different classes of forgings and describes methods for producing them.

another. Likewise a certain design might be forged in an upset forging machine in one plant and in a steam hammer in another.

It was mentioned earlier that not all forging designs can be produced from one set of dies in a single forging unit. Generally closed die forgings of 200 lb. and over require the use of two or more hammers, each having dies made with the progressive tooling required to complete the design. Some forgings may require a combination of two or more different types of forging equipment which may include a forging press, hammer, forging rolls and upset forging machine. The following are common examples of the use of the drop forging hammer combined with other types of forging equipment. The bracket used to mount the engine to the B-26 bomber is forged and then upset in a forging machine to form a cup section, thereby reducing the weight as well as eliminating an expensive machining operation. Camshafts are first upset to gather stock for a larger diameter gear section before being forged under the hammer. The flange end of a crankshaft is formed by upsetting it after it is hammer forged. In order to obtain an excellent condition of grain fibers in connecting rods, the steel billets are passed through a number of impressions in the forging rolls to obtain a proper blank which is then finished in the hammer. One method of producing axle shifts is by rolling the tapered section in forging rolls and then upsetting the flange section in the upset forging machine. Aluminum propeller blades of the solid type are produced by rolling the bars in forging rolls, flattening the blade end preparatory to forging in a 35,000 lb. hammer. After forging and removal of the flash, the hub end is heated, bearing rings put on, and then upset in a 5-in. upset forging machine.

The fabrication of propeller blades has presented some very difficult problems to the engineer who must keep within weight limitations and still attain high physical qualities. With demands of greater horsepower and faster speeds there have been at least six methods developed for the production of this item. Besides the solid aluminum blade design some propellers are produced by encasing a light webbed steel forging within a welded steel covering. Hollow steel blades of chrome-nickel-molybdenum analysis are made by using welded plate and forging construction, heat treated to a high degree of strength and toughness. Other methods developed for producing hollow blades are by rolling on automatic mill equipment and by forming seamless steel tubing.

Forgings in Aircraft

Closed die forgings have been the answer to the aeronautical engineer's problems in providing strength with minimum weight in the engine as well as in the wing and fuselage assembly of bombers and fighters. Controlled grain flow and proper distribution of metal in heat treated forgings have made it possible to reduce the engine weight to slightly less than one lb. per hp.

Crank cases for radial aircraft engines are forged from either aluminum alloy or steel. The same method is used for both metals except that aluminum requires one additional hammer operation and a press for cogging down the ingot to a 9-in. square billet, whereas steel is rolled to this size and furnished to the forger from the steel mill.

The production of steel crank case sections is accomplished by hammer upsetting the 9-in. square billet, and saw cutting to the proper weight to form the blocked or rough forging. For this operation the billets of type AMS 6382 steel are heated for 4 hr. in a Hagan oil fired rotary furnace at a temperature of 2250 deg. F. After blocking in a 35,000 lb. Erie steam hammer the forging is trimmed, the center punched out and returned to another rotary furnace for reheating preparatory to finish forging. The rough forging is finished in a 25,000 lb. Chambersburg steam hammer, again trimmed and punched, and then annealed in a cycle controlled continuous annealing furnace. After annealing, the crank case sections are rough machined, and then heated in a rotary furnace to 1525 deg. F. for oil quenching. The quench tank is of the ferris wheel type with temperature control of the coolant and designed to discharge a quenched forging each time a hot forging is placed in the tank. The drawing or tempering operation is conducted in a Ro-To-Air furnace controlled at 1210 deg. F. It may be interesting to know that the finish machined crank case forged from alloy steel is of less weight than the finished aluminum forging.

Propeller hubs and master connecting rods are drop forged from SAE-X4340 steel with prolongations on each forging for inspection of structure and physical properties. The front and rear crankshafts for radial engines are forged from type SAE-X4340 and SAE-2512 steel. These also have prolongations forged integrally with the piece for use as a quality check of the forging. Formerly a tensile test was made from each prolongation on master rods and crankshafts, but with a desire to conserve steel which was possible due to quality control and uniformity in forging processing, one engine manufacturer has changed the specifications to a fracture test of each prolongation and one tensile to represent a quantity lot of forgings.

The use of forgings in aircraft construction is not always due to a desire to reduce weight. It is not un-

common for an engineer to change from castings to forging designs because of lower machining costs, elimination of welding, reduction in inspection time and reduction in rejects and scrap losses. The tail wheel of a fighter plane and the yoke used in the retractable landing gear have been redesigned as die forgings by one company for these advantages. The inspection record of one aircraft builder shows that the use of a support forging which was formerly a casting has eliminated scrap rejections entirely. Scrap losses, which were previously 80 per cent, presented an inestimable expense due to loss of time, loss of metal and the hazards of incorrect castings which may have passed inspection approval.

Some drop forging designs may be produced in closed dies with no flash or parting line in order to attain additional quality features. Parts such as piston pins, counterweight pins and impeller gear shafts are sometimes forged in this manner. By rotating the steel billet in the die during forging reduction, the excess metal is extruded into a small gate, instead of being forced out into the gutter surrounding the die impression. This method of operation is often times termed centrifugal forging and is specified for purposes of controlling grain flow and eliminating the cracking possibilities in steel heat treated to extreme hardness. Counterweight pins of stainless type A.M.S. 5630 are specified for wear and corrosion resistance. This type which is a 1 per cent carbon, 18 per cent chrome, ½ per cent molybdenum analysis requires cooling in dry lime after forging and a slow cooling annealing cycle after soaking at 1650 deg. F. for a period of 14 hr.

Exhaust flanges are forged from stainless types 347, 321, 416 and 414 for heat and corrosion resistance. Some other applications of stainless steel forgings are gun mount posts, cartridge starters, rotor bushing, oxygen cylinder bosses and magneto shafts.

The upset forging machine has many distinct advantages for designs which lend themselves to this method of production. Forgings can be produced with deep pierced holes of uniform side wall thickness and practically free from parting line flash. These features make this method particularly adaptable to the production of aluminum pistons, cylinder liners for aircraft and torpedo engines, shell bodies, gears, pinions, hubs and flanges.

Prior to the war only steel forgings with fairly symmetrical shapes were produced as closed die forgings in forging presses. The demand for more forgings than available hammer capacity could produce encouraged further study of die design which would make press operation possible

INITIAL operation in press forging a large steel ingot into a gun tube.

o o o

on the more intricate steel designs. However, press forging of these irregular shapes is limited because of insufficient space for the necessary operations required to develop the blank. Consequently, such parts are produced by the hammer because a number of blows can be struck in the tooling for the preliminary operations. Instead of making a number of forgings from one length of the bar as in drop forgings, a cut blank or shape for each forging is necessary in press forging operations. Brass, copper, aluminum and magnesium forgings within limitations as to size and shape are produced to advantage in the forging press because of the good extrusion characteristics of these metals. Each operation or step is completed by one squeeze of the metal in whatever tooling is necessary for the particular design.

The development of aluminum and magnesium alloys of increased strength has been invaluable to the aircraft parts designer in reducing fabrication costs and improving the strength weight ratio of the parts. Landing gear assemblies formerly requiring the welding of as many as 10 or 12 steel parts have been reduced to one aluminum alloy forging. Furthermore, this change reduced X-ray rejections from 40 per cent to practically nothing, decreased machining costs and considerably improved the appearance of the job.

Forging Aluminum Alloys

There is a number of aluminum alloys suitable for die forging—their selection being dependent upon the application intended. Types 14S, 17S and 25S are commonly used for many forging parts and tensile strengths up to 65,000 psi can be developed for the 14S type after precipitation age hardening. The most readily forgeable of the aluminum alloys is A51S and for that reason it is often used for large and intricate parts. The disadvantage of this alloy is that it will not develop a high mechanical strength, and therefore its usefulness for many purposes is somewhat limited.

Aluminum has a much higher friction co-efficient than steel, making it more difficult to flow into die recesses. For this reason and because of the narrow forging limits of deformation, aluminum alloys require about two times the number of hammer blows that would be necessary for the same part forged from steel. In other words, the hammer size is about twice that required for steel in order to approximate the same production.

The shrinkage allowance in forging dies for aluminum and magnesium alloys is figured at ⅛ in. per ft. for large forgings and 1/10 in. for the small parts. An exception to this rule occurs in large propeller forgings of 70 or 80 in. lengths which contract 3/16 in. to the ft. due to the fact that there is no obstruction in the design to hamper the shrinkage.

Die forgings of magnesium alloys require larger radii and filets than aluminum and steel. There are several commercial alloy types of this metal which are forgeable within fairly narrow temperature limits. These limits range from about 600 deg. F. to 775 deg. F. for press operation on Dowmetal J and from 600 deg. F. to 825 deg. F. for Dowmetal M which is adaptable to either hammer or press forging.

Magnesium alloy forgings will produce tensile strength values up to 46,000 lb. per sq. in. in the as-forged

condition for type O which has about 8.5 per cent aluminum, 0.20 per cent manganese and 0.5 per cent zinc. They are somewhat more difficult to forge than aluminum alloys, especially those designs having thin web sections. Where it is possible to forge aluminum in a design with a minimum of ⅛-in. web thickness, magnesium alloys require 3/16 in. or an even greater thickness. The number of forgings produced from the die before reworking is necessary averages about two-thirds the die life, which is somewhat less than that obtained when forging a similar aluminum part.

Magnesium production has increased tremendously since the begininng of the war and there is no doubt that this metal, having a weight of about 60 per cent of aluminum, will have an increased use in peacetime production.

In order to withstand the speeds and stresses of modern design, forgings must provide the maximum resistance to torsional, tensional and compressional strains as well as shock and impact. To assure attainment of these specifications, the forging bars or billets are inspected before release for forging production. A complete chemical analysis and etch tests of the billets are made to check the density, segregation and surface qualities. As an aid to this inspection, all steel of magnaflux quality is subjected to a standard routine magnaflux procedure.

A sample bar length, at least equal to that required for one forging and representing the top and bottom of the first and top and bottom of the last ingot poured, and in addition two or more samples taken from random bars at other locations in the heat, are selected for Magnaflux examination. A slice cut from the end of each of these samples is macro-etched for determination of porosity, ingot structure and pipe.

The continuous wet Magnaflux method with the application of 1000 amp. per in. of cross-section is standard with Transue & Williams. Samples of square bars or billets are cut so as to obtain one-quarter of the cross-section. Round bars are prepared by turning a sample out of one-half the cross-section on centers midway between the edge and center of the bar. The samples are stamped for identification of the center sections and then heat treated to as high Brinell as is readily machinable. This heat treatment is to remove any banded structure and to increase the ability of the piece to retain magnetism. After machining to round test sizes, the samples are ground smooth ready for magnetic testing.

A permanent record of all tests is made on imbibition paper (unsensitized photographic paper) and the prints are filed with a complete record of the heat, indexed to the particular lot of forgings produced. The prints are prepared by first soaking the paper in warm water to soften the emulsion, after which the excess water is taken out by use of squegee and blotting paper. The Magnafluxed specimen is dried and then rolled over the paper which is placed face up on a flat plate.

Magnaflux inspection is also a routine procedure on the finished forging, enabling the inspector to discover any laps, checks, cold shuts or seams that may be difficult to find by the usual examination and also aiding in the elimination of their causes.

There has been some effort made by the aircraft engine manufacturers to standardize inspection and operation procedure for some of their engine parts—particularly the crankshaft. Facilities in the various forging plants are not of uniform type which would permit operational control to standard methods. However, inspection standards applying to the important and highly stressed designs are considered essential and should possibly cover more phases of inspection than are now specified. The locations for Brinell hardness testing should be shown on the forging prints and should not be misconstrued with internal hardness of the finished machined parts. In a great many cases the specified minimum hardness of the forging surface is too low to meet the required physicals when taken at the center or at a midway cross-section location.

The expected decrease in hardness from surface to a center location should be taken into consideration and sufficient surface hardness permitted in the rough forging to meet machined surface Brinells and required physical properties within the forging.

Convenient Silver Solder Dispenser

AN easy-to-make dispenser, suggested by a workman at General Electric's Schenectady Works, simplifies the feeding of ribbon-type solder in silver-alloy brazing work and prevents waste. The dispenser is a flat metal case containing two rollers, one in the circular portion and another near the point. The silver solder is thumb-fed over the second roller and out the point of the dispenser through a slot in the edge of the case.

Previously, the operator would cut a piece of solder about 2 ft. long, which would get too hot to handle as the strip became shorter. With the dispenser, however, the operator's hand is kept far enough away from the work to avoid being burned. The dispenser can be loaded quickly with sufficient solder for a large number of brazes and none is wasted.

Broken Press Frame Casting Redesigned To Welded Steel

By W. J. CONLEY
Welding Consultant, Lincoln Electric Co. Cleveland

. . . Replacing a cast iron frame which failed due to overload with a welded steel unit increased the safe load capacity by 66 per cent at a weight saving of 20 per cent.

ALTHOUGH the arc welding process has long been accepted as a most economical method of machine construction, the trend to welded design is being strongly emphasized under today's emergency conditions. Vital machinery essential to production must be quickly repaired or replaced in order to meet unprecedented wartime schedules.

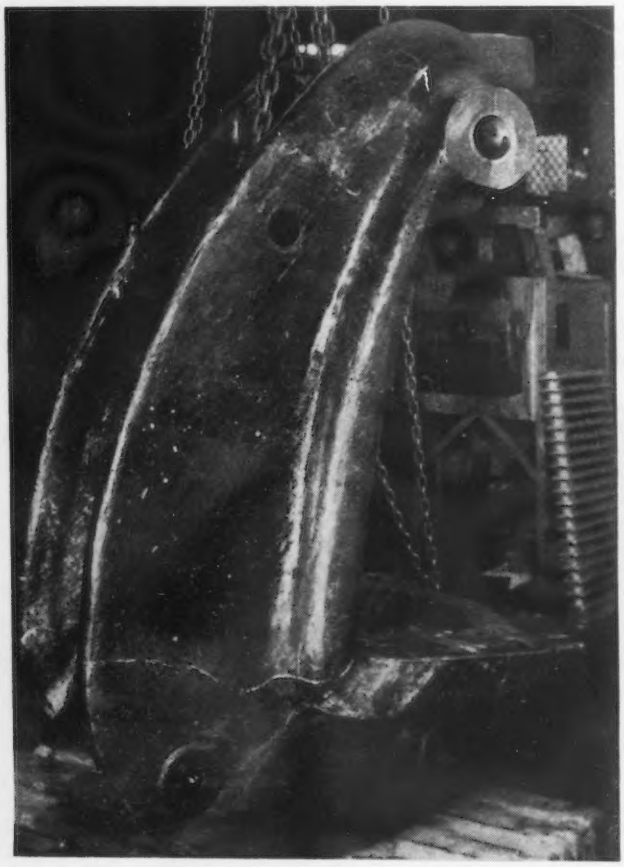
A typical case recently involved the replacement of a broken press frame which failed after several years of service. Made of relatively low strength cast iron, a load of 35 tons proved too high for this casting which factured at the point indicated in Fig. 1 and detailed in the cross-sectional drawing, Fig. 2.

The stress analysis shown in Table I indicates that the cast iron frame was too highly loaded with 35 tons and none too safe for 30 tons.

To replace this 3300-lb. cast frame would not remedy the weakness; therefore, a redesign would be necessary, entailing the making of a new pattern. The cost for such a new casting would be about $280. It was decided to replace the frame with a welded steel design shown in Fig. 3.

Welded Redesign

The welded redesign not only effected a 32 per cent saving in cost of the frame but resulted in a weight reduction of 20 per cent and an increased safe load capacity of 66 per cent. This figure is based on a maximum allowable working stress of 5000 lb. per sq. in. for cast iron as compared to 20,000 lb. for mild steel (see Table II). The large ratio of allowable stress is due to the fact that in addition to a lower ultimate tensile strength, cast iron must be used with a larger factor of safety due to its inherent properties. Cast iron



LEFT
FIG. 1—Cast press frame showing fracture at stress point near bottom portion.

RIGHT
FIG. 2—Detailed cross-section of broken press frame casting at point of failure.

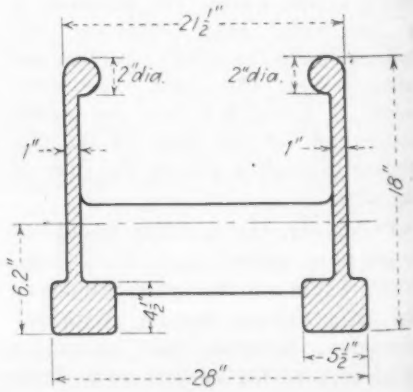


TABLE I

Stress Analysis of Original Cast Iron Design

Area of cross-section at point of maximum stress, section shown in Fig. 2	69 in.^{2}
Moment of inertia with respect to axis through center of gravity	1880 in.^{4}
Distance to outside for maximum in tension	6.2 in.
Distance to outside for maximum in compression	11.8 in.
Bending moment arm with respect to axis through center of gravity of section (Fig. 2)	16 in.

For a 35-ton load:

$$\text{Tensile bending stress} = \frac{35 \times 2000 \times 16 \times 6.2}{1880} = 3700 \text{ lb. per sq. in.}$$

$$\text{Compressive bending stress} = \frac{35 \times 2000 \times 16 \times 11.8}{1880} = 7050 \text{ lb. per sq. in.}$$

$$\text{Direct tensile stress} = \frac{35 \times 2000}{69} = 1010 \text{ lb. per sq. in.}$$

Total tensile stress = 3700 + 1010 = 4710 lb. per sq. in.
Resultant compressive stress = 7050 − 1010 = 6040 lb. per sq. in.

For a 30-ton load:
Total tensile stress = 4040 lb. per sq. in.
Resultant compressive stress = 5255 lb. per sq. in.

LEFT

FIG. 3—Weld fabricating a press frame of steel plate design.

° ° °

RIGHT

FIG. 4—Detailed cross-section of new frame at the smallest section of the frame throat as redesigned for welding.

TABLE II

Stress Analysis of Welded Redesign

Area of cross-section of section, Fig. 4, where bending stress is maximum (taken at smallest area of throat)	47.6 in.^{2}
Moment of inertia with respect to axis through center of gravity	824 in.^{4}
Distance to outside for maximum tension	6.5 in.
Distance to outside for maximum compression	8.9 in.
Bending moment arm with respect to axis through center of gravity of section (Fig. 4)	17.6 in.

For a 50-ton load:

$$\text{Tensile bending stress} = \frac{50 \times 2000 \times 17.6 \times 6.5}{824} = 13900 \text{ lb. per sq. in.}$$

$$\text{Compressive bending stress} = \frac{50 \times 2000 \times 17.6 \times 8.9}{824} = 1900 \text{ lb. per sq. in.}$$

$$\text{Direct tensile stress} = \frac{50 \times 2000}{47.6} = 2100 \text{ lb. per sq. in.}$$

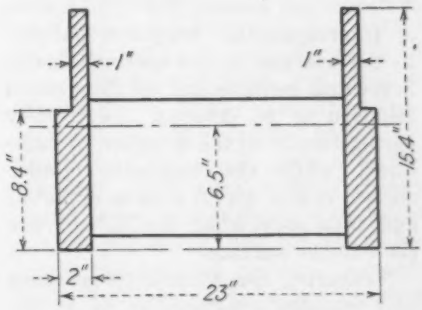
Total tensile stress = 16,000 lb. per sq. in.
Resultant compressive stress = 16,900 lb. per sq. in.

For a 30-ton load:
Total tensile stress = 9600 lb. per sq. in.
Resultant compressive stress = 10,150 lb. per sq. in.

contains carbon in the form of graphite which is weak and brittle. This material is susceptible to failure by rapidly applied shock loads producing tensile stress. Hot rolled steel plate is relatively tough and homogeneous performing equally well in tension or compression.

By duplicating the cast frame in welded steel the structure had at least three times the strength and equal resistance to deflection under the increased load made possible as compared to the cast iron under the lighter load. The welded frame was designed approximately the same size so as to use the old working parts and at the same time increase capacity. A detailed cross-section of the welded design, taken at the smallest section of the frame throat, is shown in Fig. 4.

The welded frame, shown being processed in Fig. 3, consists of 1-in.



steel plate, flame cut to size with the matched edges of the side pieces butt welded. The overlaps and cross members are joined by means of fillet welds.

30-In. Graphite Electrodes Now Available

RESEARCH by National Carbon Co., Inc., has resulted in the development of two new and larger sizes of graphite electrodes. The new electrodes are 24 and 30 in. in diameter—the first graphite electrodes of these sizes to be produced commercially. Major problem to be met in increasing the size of graphite electrodes without sacrificing other desirable physical properties was that of strength. This problem was met and the 30 in. electrodes are proportionately as strong as the widely used 18 in. electrodes.

Although at the present time there are no electric steel furnaces which require the 24 and 30 in. electrodes, the availability of the electrodes will make possible new developments in furnace design and have an important influence on future electric furnace production.

Sheet Fractures Detected With Supersonics

. . . German supersonic equipment has been developed to non-destructively locate intercrystalline fractures parallel to the surface of steel sheets. A continuous water contact is maintained between the steel sheet and the oscillator.

STANDARD methods for the non-destructive testing of materials are not suitable for the location of intercrystalline fractures parallel to the surface in the case of sheets. Screening methods fail as the defects required to be detected are usually perpendicular to the direction of radiation, while the magnetic powder method is only useful with steel plates, and then only when the defects are close to the surface.

Measuring the electrical resistance only enables non-cohesion to be detected when the sheet surfaces are polished or at least clean. In these methods, the electric current is passed straight across the sheet and the drop in potential through the sheet is measured; a fracture increases the electrical resistance and hence gives a greater potential drop. But this method fails under works conditions, as the surface of the sheet is rarely polished, but is covered more or less with scale and rust. Although small areas of the surface can be suitably polished for a local test, a thorough test over large areas of sheet would prove very tedious and impracticable.

Pointing out these shortcomings in a report from the Vierjahresplan Institut für zerstörungsfreie Prüfverfahren, Berlin-Dahlem, reproduced in the Zeitschrift des Verein deutscher Ingenieure, A. Trost gives an account of what has been achieved in this type of test with supersonics, which have already proved useful in other directions for the testing of materials. As indicated in Fig. 1, if supersonic waves are passed through a material from a transmitter *a*, the sound waves will be propagated rectilinearly if they are not at a sufficiently high frequency. When they meet an air cavity, the waves are reflected and no supersonic waves are transmitted. If a receiver is therefore arranged on the other side of the sheet, waves will be detected at all points where they have traversed an uninterrupted path, but no waves where the wave path has been intercepted by a defect.

For another article on this new testing practice, see "Ultrasonics — New Metallurgical Tool," May 15, 1941, p. 48.

The range or sensitivity of the method depends on the wave length of the supersonics within the material and hence on their frequency. To produce interception, that is a supersonic shadow, behind a fault, the wave length must obviously be smaller than the diameter of the fault, for if the wave length were greater the waves are completely diffracted round the fault. With a frequency of 10^6 c.p.s., the wave length for steel is 5.1 mm. Normally it is sufficient with sheets to locate partings which cover an area of more than 5 mm. in diameter, so that a frequency of 10^6 c.ps. is adequate in most cases.

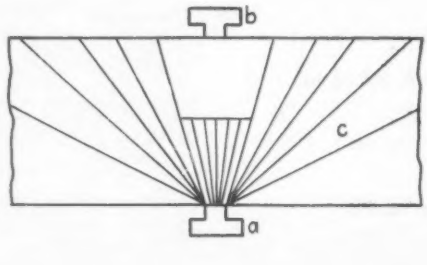
With sound waves of such a high frequency, extremely fine partings present insurmountable difficulties, for already with an air gap of only 10^5 mm., 99 per cent of the sound energy is reflected at 10^6 c.p.s. and only 1 per cent is transmitted. It should, of course, be remembered that defects are not always due to plain air gaps, but may be partly filled with slag, oxides, etc., when they have a greater transmissibility for sound waves than a plain air gap.

But the increased resistance to the passage of sound waves, even of the finest air gaps, renders the practical application of this method all the more difficult. If a transmitter, for example, an oscillating quartz crystal, energized piezo-electricallly by a high frequency potential, is placed in direct contact with the surface of a steel sheet, no supersonics would be transmitted to the sheet at all, as there would be a small space between the crystal and the sheet owing to the uneven surfaces, which as a rule would be greater than 10^5 mm.

A technical solution to the problem was found in using running water as a coupling medium, as in Fig. 2. The vibrating quartz (*a*) is connected to a high frequency transmitter set by a special cable (*b*), and is cemented to a metal block (*c*) which transmits the mechanical vibrations of the crystal through the water column to the specimen (*f*). The transmitter is connected to the water main, the water flows through a small aperture into the space between metal block and specimen and is removed at the side between the latter and the transmitter. The water bulge developing there protects the sound path against the penetration of air bubbles.[4] The ultra high frequency sound receiver is arranged in a similar manner at the top of the apparatus, and is connected to a suitable amplifier. The receiver is to be applied from above, and the water flows out underneath the specimen. Any air bubbles and surplus water escape through small ducts at the top near the receiver.

o o o

FIG. 1—When supersonic waves from a transmitter are passed through a material (c), from a transmitter (a), the waves are reflected on meeting an air cavity and do not reach a detector (b).



An adequate sound contact will be maintained as long as the surplus water is kept flowing from the top outlet by suitably adjusting the water feed. The sound contact between quartz and specimen will not be interrupted when transmitter and receiver are placed about 1 mm. distance from the sheet, respectively, contact being effected by the escaping water. Heavy rust or scale layers on the sheet will be found to offer no obstacle under these circumstances.

Transmitter and receiver sets are provided with rollers, which allows for a setting of about 0.5 mm. between transmitter or receiver and sheet respectively. For examining sheets of medium width, these are fixed to one leg each of a fork-shaped clamping device. When testing, a spring presses the sets against the sheet for close contact. For testing large sheets, transmitter and receiver are moved backwards and forwards by an electric motor along two rail guides, the requisite contact pressure being effected as before, by springs or by an electro-magnetic device.

The single-stage sender set is equipped with a 15-watt thermionic valve. The vibrating quartz disk measures 25 mm. in diameter. The diaphragm of the receiver is set at 10 mm. A multi-stage amplifier, tuned to the sender frequency, is connected to the receiver. The ultra high frequency sound, modulated at 100 cycles per sec., is detected by means of a headphone, indicated by a discharge lamp or reproduced by a recording device.

At first the formation of standing water in the column promoted difficulties.

At one megacycle per second, the wavelength λ of the ultra high frequency sound is 1.4 mm. in water. Maximum sound energy is obtained when the length of the water column "w" is a multpile of $\lambda/_2$. This energy becomes a minimum when "w" is an odd number, multiple of $\lambda/_4$. The value of "w" may vary during the tests owing to the surface roughness of the sheet involving fluctuations of the sound energy and disturbance of the measurements. This interference can be eliminated by applying rapid periodic variations of the frequency within a certain range, at the same time increasing the length "w." In this manner, the radiation of the ultra high frequency sound will become practically independent to the length of the water column.

Test Results

An I-girder with 25-mm. sheet thickness was examined for flaws with an ultra high frequency device. The areas found defective were marked in white. The girder was subsequently subjected to a buckling test when it gave way at the weak point indicated by the test. The areas within the dotted lines, being areas ascertained by the sound test, were cut out into three sections, A, B and C, and the edges

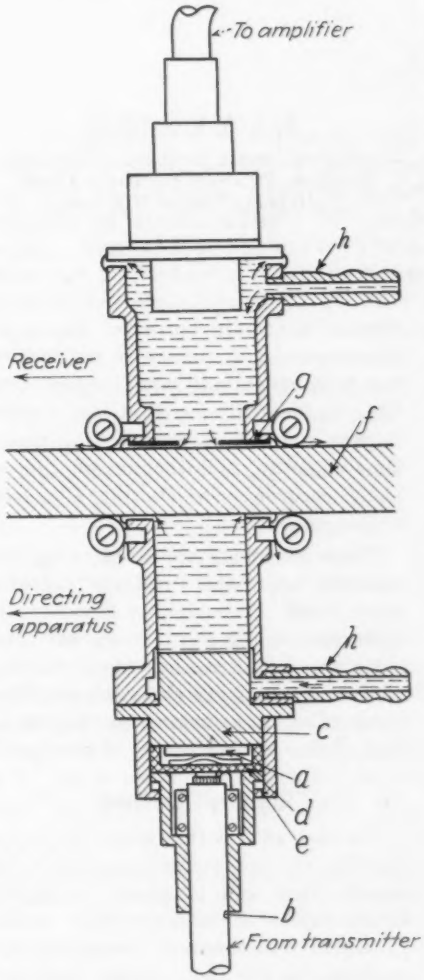


FIG. 2—Apparatus for testing material by utra-sound waves. Vibrating quartz, a; high frequency cable, b; metal closure, c; insulating portion, d; seal, e; test material, f; ultra-sound wave, g; and water inlet, h.

o o o

again tested by the magnetic powder method. The results proved to be in perfect agreement with those gained by the sound test. All points previously indicated as faulty were confirmed to be so, and no more defects could be detected with the check test.

The patterns obtained on steel trip A, which part when sound tested proved thoroughly bad, indicated several longitudinal gaps partly overlapping each other. The sample B was found defective in its front part and faultless at the back. This again was confirmed by the structure of the magnetic powder pattern. Particularly accurate sound tests were carried out on the area corresponding to strip C.

No sound radiation was determined in the whole area marked in white, even when applying conditions of maximum sensitiveness of the amplifier. In conformity, the magnetic powder pattern showed here a great number of discontinuities located above each other. No sound radiation either could be detected in the cross-hatched part, at normal sensitiveness, but radiation was indicated at maximum conditions of sensitivity. According to the powder pattern, cracks were present in this region, extending from about 5 to 15 mm. in diameter. The ultra high frequency sound is reflected when meeting gaps of this kind, but is strongly diffracted round the edges of the faults. These diffracted sound rays were traceable at a 10-mm. adjustment of the diaphragm at maximum sensitiveness. The sound test detected faults in some parts of the single-hatched area, and none in other portions of this same area. Correspondingly the powder patter indicated a few small cracks in the material. The ultra high frequency sound wave transmission was found almost unhindered in the area between the hatched regions. Accordingly, only very slight cracks were perceptible in the pattern.

Noteworthy were the forms of the faulty parts. They proceeded along the longitudinal axis of the girder, which was the rolling direction of the sheet, and appeared as long straight lines as viewed at the front of samples A and B. The extension in width of the defects was essentially smaller and more irregular, particularly on section C. The faults obviously represented pores and small blow holes in the ingot.

References

[1] L. Bergmann, "Der Ultraschall," 3rd Ed. Berlin, 1942, pp. 305-17. O. Muelhaeuser, D.R.P. 569-98 (1931). S. J. Sokoloff: *"Phys. Z.,"* vol. 36 (1935), pp. 142-44. F. Kruse: "Zur Werkstoffprüfung mittels Ultraschall" (Test of materials by ultra high frequency sound). Diss. "Techn. Hochschule), Hannover," 1938. Extract in *"Akoust. Z.,"* vol. 4 (1939), pp. 153-68, and vol. 6 (1941), pp. 137-49.

[2] W. Tellinghaus and F. Staeblein, *"Techn. Mitt. Krupp Forsch.-Ber.,"* vol. 4 (1941), pp. 31-36. Extract in Z. V.D.I., vol. 85 (1941), p. 645.

[3] See paper by F. Kruse, (Ref. 1).

[4] In some cases, when point-by-point testing of suspected parts will be considered sufficient, the water space can be enclosed with a fine porous cloth through which the water will trickle, effecting an adequate sound contact.

Controlling Machinability

By S. B. KNUTSON

Chief Metallurgist, Ordnance Management Division, St. Louis Ordnance Plant, McQuay-Norris Mfg. Co.

o o o

IN the manufacture of armor-piercing bullet cores at this plant, some conclusive observations in the high speed machining of small parts of high carbon alloy steel have been possible. In the development and design for the production of a part of this nature, the mechanical factors must first be balanced and correlated. These items are primarily those of cutting feeds and speeds, cutting angle, methods of chucking and holding the part, methods of chucking and holding the cutting tools, and lubrication of the machine and tools. They are of first and probably utmost importance in the program of high speed machining with high production of small parts.

After these factors have been somewhat established, the next factor of importance is the material to be cut and the condition of this material. This item is primarily one of a metallurgical nature. In a series of observations, planned production programs and experimental tests, various metallurgical and physical characteristics were compared and correlated. In a first series of tests, it was apparent that a properly annealed structure was one of the most important factors. In further determining this factor, various types of annealed structure, or various stages of pearlitic anneal vs. 100 per cent spheroidized anneal were compared, and it was in due time concluded that the latter was the superior machining steel. A further investigation of various 100 per cent spheroidized, annealed materials indicated a certain optimum degree of coarseness of structure to be desired for best machining and longest tool life. In determining this last factor it was noticed, however, that problems of setup, maintenance of dimensions, occurences of chatter, etc., had to be considered.

These problems appeared to be dependent upon the "rigidity" of the stock itself. This rigidity becomes an apparent requirement when we consider the small section involved, the method of chucking the stock and the distance of the chucking contact from that of the cutting points of pressure.

"Rigidity" Defined

For lack of a better word, the term rigidity in the above paragraph is loosely used and is meant to apply to the region of stresses above those in which the common conception of modulus of elasticity holds true. In the initial stages of tensile testing, the stress-strain curve will follow a straight line relation and the slope will be the same for all types of steel if plotted to the same scale. However, it is only during the initial stages of stress that this is true and often the curve will deviate from this line rather early in the application of stress. In the accompanying table and in Fig. 1 some data taken directly from stress-strain charts produced in an automatic recording tensile machine illustrate the variations that occur in the same grade of steel subjected to different heat treatment and cold work. Sample 10D, for example, was annealed and machine straightened only, while samples 4B and 20C were annealed, cold drawn and machine straightened, but with different conditions of annealing and cold drawing.

In Fig. 1 there is noted the points of deviation wherein the stress-strain relation is no longer a straight line and the deflection no longer proportional to the load. In sample 10D, this relationship holds true only up to a stress of 20,350 lb. per sq. in. whereas in the case of sample 20C this relation holds true up to 43,200 lb. per sq. in. Were it to be assumed that in a cutting operation of the kind mentioned (where the overhang from the collet chuck is large in relation to stock diameter) the stress produced by the cutting tool exceeded that of the sample 10D but was under that of sample 20C, the former would deflect a greater amount than the latter and consequently there would be an irregularity in the diameter of the piece turned. The term rigidity has been resorted to in order to distinguish between two conditions.

It is rather surprising that as extreme a range as indicated in the ultimate strengths is possible from the factors of processing mentioned. As will be seen later, in setting up criterias for specifying material, the ultimate strength factor has been selected as one of the governing factors as this figure seems to be directly related to the point of deviation of proportional limit, which is probably the deciding physical property in this particular cutting operation. As will be seen, it is desirable from the standpoint of machine adjustment to maintain the maximum tensile strength or the maximum straight line relation or highest point of deviation.

Inasmuch as this conception of

TABLE (See Fig. 1)

Supporting Data for Stress-Strain Curves Plotted in Fig. 1

Sample No.	Diameter of Stock, In.	Point of Deviation		Yield Point		Ultimate Strength	
		Actual, Lb.	Lb./Sq. In.	Actual, Lb.	Lb./Sq. In.	Actual, Lb.	Lb./Sq. In.
10D	0.262	1100	20,350	2360	43,600	3980	71,980
4B	0.265	1950	35,300	4400	79,800	5320	96,360
20C	0.266	2400	43,200	5100	91,850	7120	130,175

# of Screw Machine Stock . . .

rigidity depends primarily on the amount of cold work, which can be expressed in terms of tensile analysis, further investigation was made on the tensile properties of bullet core material with respect to the best machinability. It was eventually possible to isolate and ascertain a range of tensiles which appeared to reduce the objectionable conditions to a minimum or eliminate them entirely.

With these known factors it was then possible to predetermine the machining quality of the material as received and to put this knowledge into practice. By means of the standard spheroidization chart illustrated and a specified preferred range of tensiles, it was possible to maintain a relatively standard material.

Spheroidization Chart

To be specific, a chart has been developed showing progressive degrees of spheroidization in which the coarseness of structure is rated in the order of 1 to 9, from very coarse to a very fine annealed structure. Experience at this plant has indicated that a structure in the range of 3 to 5 in the chart is to be desired. However, on analysis of the material with in this structure range, it was also found that a range of tensile strengths in the order of 105,000 to 115,000 lb. per sq. in. is necessary to give the optimum in machining.

To illustrate the necessity of considering both factors as a team, some combinations of these conditions were tested. Two lots of steel were received from two different sources. Both lots showed an ultimate strength of from 105,000 to 115,000 lb. per sq. in., but in machining these two lots, they behaved quite differently. On structure analysis it was found that one showed a degree of spheroidization rated as 3 to 5 as opposed to the other lot showing a structure of 7 to 8. In terms of productivity, the former showed a high tool life of approximately 9500 cores per tool setup, a dimensionally uniform acceptable part and a high production efficiency

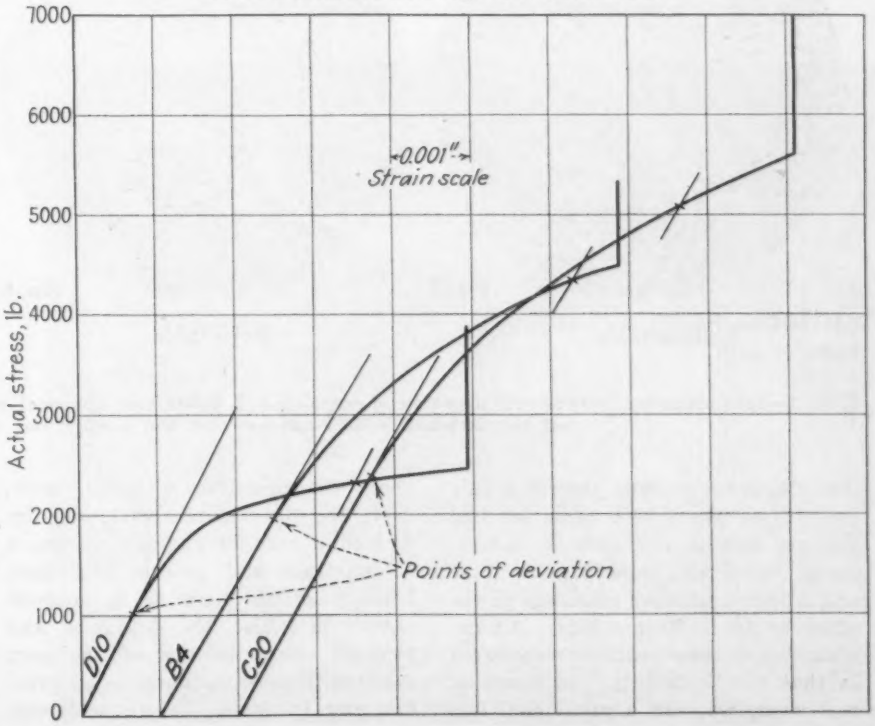
. . . Experience with large tonnages of cold drawn alloy bar stock received from practically all major sources in the past two years has led to certain definite conclusions as to the metallurgical aspects of machinability of small calibre armor piercing bullet cores. Depending upon the stock diameter, definite limits have been set on the fineness of a spheroidized annealed structure and related tensile strengths. A new concept of "rigidity" has been set up.

which was rated at 90 per cent. The other group, however, with the finer structure, showed a very low tool life (about 2800 cores per tool change), a dimensionally uniform acceptable part and a fairly high operating efficiency on the order of approximately 86 per cent. The principal difference in this case appeared to be in tool life. The comparable production efficiencies, however, were of particular interest, and it was explained by the production department that the fine structure was very easy to set up on, with simple tool adjustments, and gave a uniform part from piece to piece; but the tool wear, although uniform, was very rapid and a consequent low tool life resulted.

Variations in Tensile Strength

As a second case in point, two lots of steel were received, both containing the same annealed structure of 3 to 5, according to the chart, with in the once case an optimum ultimate strength of 105,000 to 115,000 lb. per sq. in., as opposed to the other case which showed a range of ultimate strength of 88,000 to 98,000 lb. per sq. in. In recording the performance of these two materials, it was noted

FIG. 1—Schematic diagram of stress strain-curves of the same material subjected to different degrees of annealing and cold work. For clarity, the points of origin of the curves are distributed along the strain ordinate.



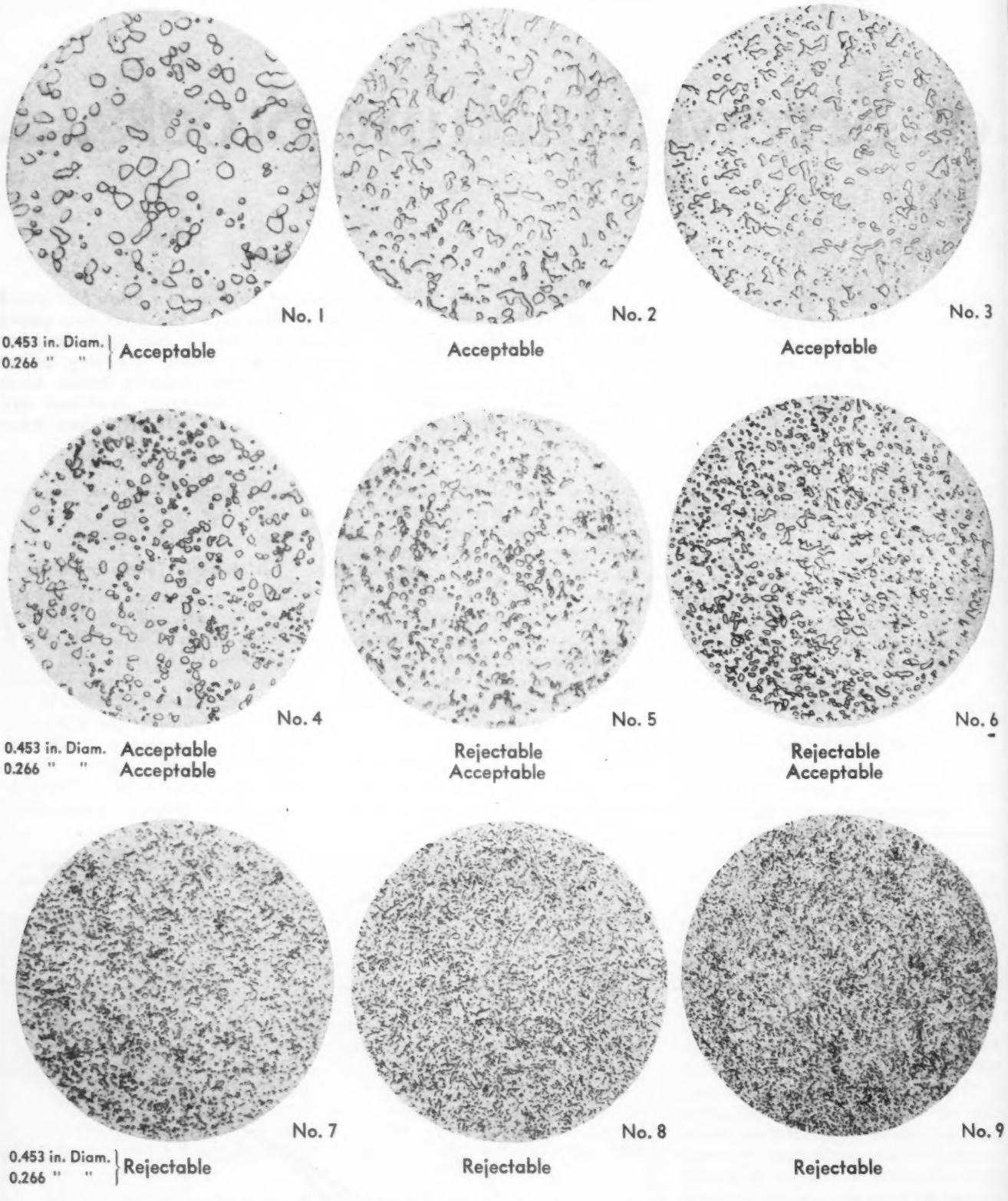


FIG. 2—Spheroidization chart at 1000 diameters of annealed A. P. bullet core bar stock material. (0.65-0.75 per cent C; 0.75-1.00 per cent Mn; 0.15-0.30 Si; 0.85-1.05 per cent Mo; 0.040 P max. and 0.040 S max.)

that the latter product showed a fair tool life, or about 9000 cores per tool change, but a considerable dimensional variation from core to core and a low production efficiency in the order of 55 to 60 per cent. An explanation of these conditions appeared in that the "cutability," in terms of tool wear, was not a great deal less than the optimum material; however, the dimensional variations indicated a lack of rigidity necessary to maintain and process the stock from piece to piece to a uniform dimension. Also, the flexibility and bending characteristics of the part resulted in some instances in an overcut and in others in an undercut, which further explains these variations in dimensions. The lower operating efficiency is explained in that frequent setups and tool adjustments and an occasional breakdown of tools due to jamming in excessively deep cuts, all contribute to an excessive amount of down time from operations.

An attempt has been made to illustrate the two prime factors in terms of the three governing requirements of production, namely, tool life, quality of finished part and quantity of production. The importance of these prime factors will vary depending on the particular plant and the part being machined. Where tool cost and tool maintenance is high, machinability or cutability would be the prime factor. This is opposed to a condition where the part involved and the processing costs are high; then minimum setup time and dimensional uniformity would be the prime requirements. In approaching the optimum in any one job, the costliest or most important factor can be favored in terms of the processing of the steel to be used. A closer control of annealed structure can be maintained where tool life is of prime importance, for example, as opposed to a second case where cold work and rigidity should be controlled for ease of setup and minimum down time for adjustments. It would appear that these prime factors could be balanced to meet different conditions of size of stock, method of chucking and type of cutting operation.

Importance of Uniformity

All this discussion is predicated on a degree of uniformity of one or both factors, and possibly the ranges indicated are narrower than commercially possible. However, the role uniformity plays cannot be stressed too greatly, particularly in multiple-spindle screw machine production, and its effect should be illustrated. If we assume a product (of which we have actual performance evidence) showing approximately a total of 4 per cent of the steel below and above the optimum indicated in annealed structure, and express this in terms of 100 loadings to a six-spindle automatic screw machine, there would be a total of 600 bars involved. Considering these 600 bars and the 4 per cent indicated, there would be a total of 24 bars outside the optimum. Now, considering these 24 bars as potentially being charged to the screw machines in 24 different loadings or charges, they would consequently affect all 24 loadings, resulting in the overall detriment of six times 24, or a total of 144 bars. Consequently, the 4 per cent product has actually affected 24 per cent of the production performance. The same illustration will hold where a product of 100 loadings of 600 bars contains 4 per cent out-of-range in terms of ultimate tensile strength.

To enlarge further on this point of uniformity, if we were to consider a product showing 4 per cent variation annealed structure, which in the subsequent cold working process is drawn under conditions to yield 4 per cent variation out of the range in cold working, the amount of material and the degree out-of-range have been increased by an amount considerably greater than the total of the two out-of-range variations in themselves. It can be seen how the portion of material out-of-range on the low side of the annealed structure subsequently being cold worked on the low side of the out-of-range in cold drawing, gives a very contrasting product to that processed from the high side of the out-of-range annealed structure under the conditions of the high side of the cold working process.

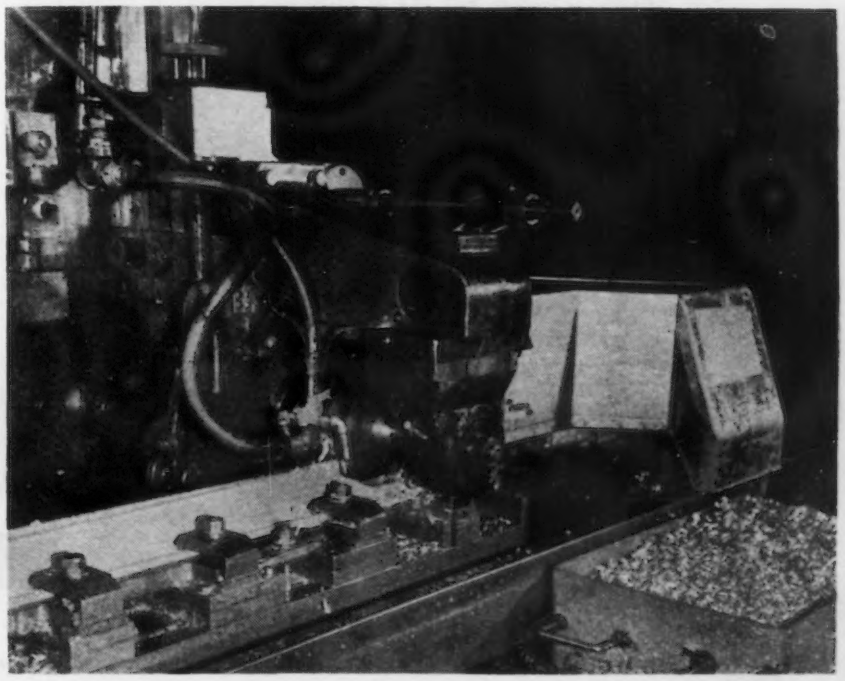
In summary, with respect to the steel itself, the machining of small parts is dependent primarily on the annealed structure, the rigidity of the stock (cold work) and lastly, the uniformity. A great deal can be accomplished in terms of maximum production and greatest machinability where uniformity itself is an accomplished fact, particularly as the conditions in multiple spindle machining are such that an "off-color" bar not only makes itself evident within itself, but it contaminates all bars contained with it as a group in process. However, by determining the prime factors within reasonable commercial ranges, and stressing the importance of uniformity within these factors, a great deal more will have been accomplished towards an optimum steel for highspeed machining under high production requirements.

---

o o o

AN ingenious compressed air attachment for removing chips from extruded spar milling machines has been developed as a result of employee suggestions at the Glenn L. Martin Co., Baltimore. With the new attachment, twin jets of air are directed on each side of the milling cutter by means of copper tubing. The air current carries the chips into a duct attached to the machine and thence into a mobile receptacle. Prior to this invention, one worker was constantly required to brush the chips from the bed of the milling machine. Furthermore, the new device maintains a clean shop and by segregating the scrap at the source keeps the chips from being contaminated by dirt and chips of other types of metal.

o o o



Grinding Lead Screws

Accurate to 0.0002 In.

IT is evident from the foregoing article that it is of paramount importance to watch constantly the condition of the workpieces as they are ground. Operating conditions vary rapidly and adjustments must be changed as soon as any deviation occurs. Therefore, rapidly operated inspection equipment is necessary. This equipment should be capable of checking thread form, pitch diameter and lead.

Pitch diameters are checked in the conventional manner over wires or with thread micrometers. Since these methods are already common practice, they will not be discussed here.

For most purposes thread forms can be satisfactorily checked by the Shadowgraph or optical comparator. For the particular job of checking highly accurate lead screws, however, it was considered more practical to build a special instrument to eliminate the necessity of involved formulas for figuring helix angles and changes in thread angles resulting from tipping the screw on the helix angle.

This instrument, Fig. 7, consists of a pair of bench centers on which is mounted a slide for holding steel templates and a graduated microscope. The templates are made from standard high speed steel tool bits, accurately squared and ground on the end like lathe threading tools. After grinding, the templates are carefully lapped to insure smooth sighting edges. Since the templates are held in the bench center parallel to the axis of the workpiece, no corrective computation for helix angle or thread angle is necessary; the template is

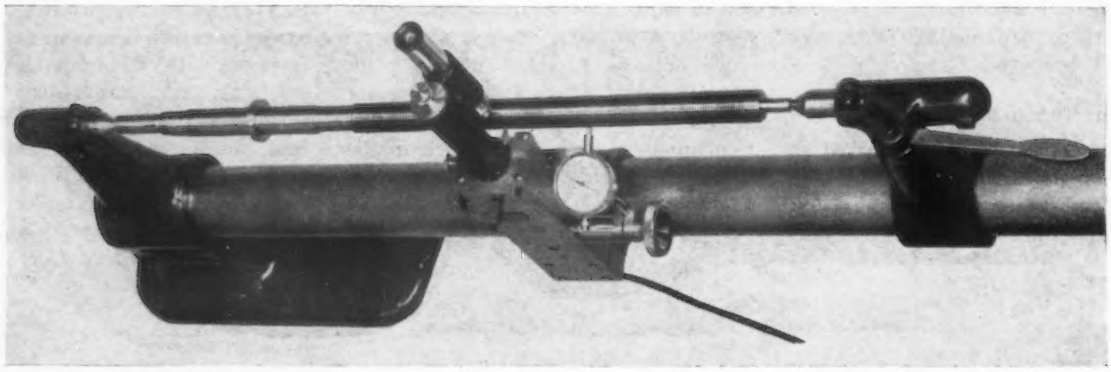
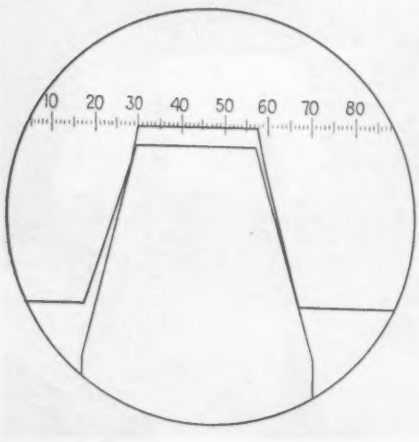


FIG. 7—Thread form-checking instrument, showing template gage inserted into thread. Plane of sighting edges of template is parallel with axis of workpiece, eliminating necessity of calculating helix angle or change in thread angle due to helix angle.

BELOW

FIG. 8—View through microscope, showing method of determining necessary corrections by comparison with template gage. Graduations on microscope reticle assist in estimating amount of correction required.



o o o

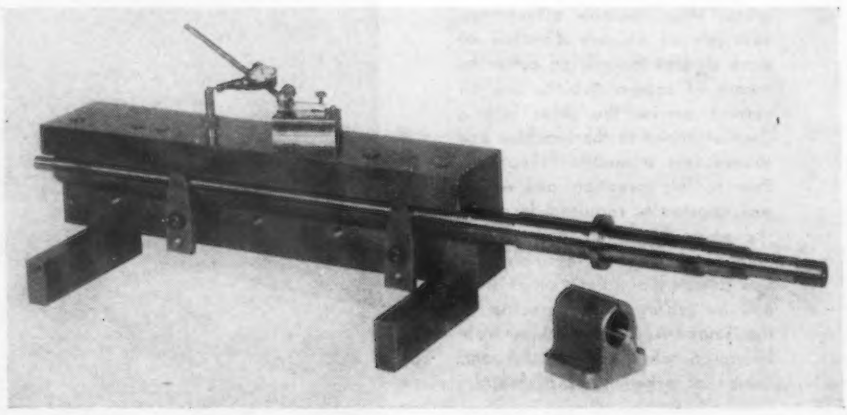


FIG. 9—Fixture used for checking lead of jig borer lead screw.

in 16 In.

By J. R. MOORE
Secretary, Moore Special Tool Co., Inc., Bridgeport, Conn.

made exactly to the nominal thread dimensions.

The template is pushed through the holder and its sighting end inserted into the threaded workpiece. The thread is then examined through the microscope and compared with the template (see Fig. 8). This inspection is extremely rapid and accurate. Adjustments are made on the wheel-trueing device until the template is made to "shut out light" in the thread form.

Checking Lead

In addition to thread form checking, some rapid way of measuring the lead of the thread on the workpiece is necessary. Conventional methods involving the use of gage blocks are far too slow, and unless skillfully handled, prone to error. Our method is pictured in Fig. 9 and in the accompanying sketch, Fig. 10.

The workpiece is lightly clamped into the fixture and a tapered pin, inserted through one of the holes, is brought against one flank of the thread. An indicator is now brought against the top end of the pin and its reading noted. The pin is then inserted into another hole and a comparative reading is made with the indicator. If the heights are alike, the lead of the workpiece is correct. If not, it is easy to calculate the lead error. In the case of a steep-sided flank, considerable magnification is attained. On an Acme thread, for example, the pin moves up or down approximately four times the lead error. Therefore, the overall results of the use of this fixture are sensitivity and accuracy of a high degree.

This procedure has substantial advantages over conventional methods. It must be understood, however, that it does have some limitations. For instance, the fixture is effective only for the diameter of screw for which it is made. Spacers, V-blocks or parallels can be made to accommodate other diameters, but these are unsatisfactory makeshifts and detract somewhat from the accuracy of the readings. Furthermore, the fixture is difficult to make, since it entails the highest possible precision in the location of the pin holes. The pins must fit the holes closely, and the gaging top surface of the fixture must be scraped parallel to the V. Moreover, since the workpiece is located in the fixture on its outside diameter, the pitch circle must be concentric with it. It is also necessary that the pitch diameter be uniform. Errors in either of these respects will produce untrue readings. Altogether, it has the limitation that it is not a flexible, universal arrangement and is good only for one particular type of workpiece.

On the other hand, it has advantages that far outweigh its limitations. It is extremely effective for its particular job. The close proximity of all parts contributes enormously to its rigidity; as a result, measurements are made very accurately. Its operation requires much less skill than conventional machines. Its chief advantage lies in its rapidity. If ground at room temperature, a workpiece may be removed from the machine, clamped in place, and the lead checked in a matter of minutes. This is of great importance since adjustments on the grinder must be made immediately to meet rapidly changing conditions.

Charting Lead Errors

In order to maintain constant control of all conditions, a chart of errors

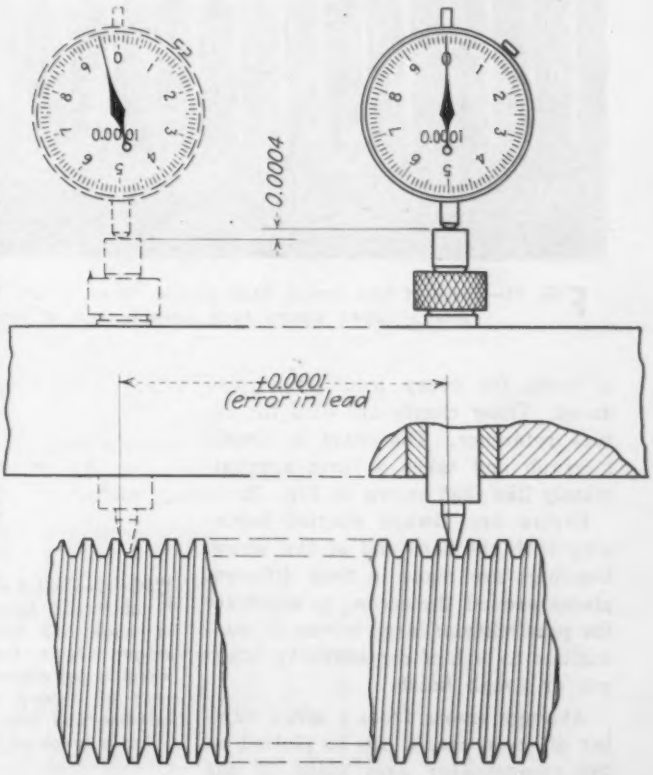


FIG. 10—Exaggerated schematic view illustrating checking principle employed in fixture shown in Fig. 9. Note that reading of right hand indicator shows pin to stand 0.0004 in. higher than when in left hand position. With 29 deg. Acme thread, lead of screw between these two holes is therefore 0.0001 in. too long. Errors are minimized by using the *same* pin and the *same* indicator setup for both positions.

. . . In the second and concluding part of the article, the author illustrates special equipment devised for checking tooth form and lead accuracy of precision screws. Use of a lead screw as a measuring device depends upon proper alinement with the nut and the several methods of achieving this are discussed, together with the factors involved.

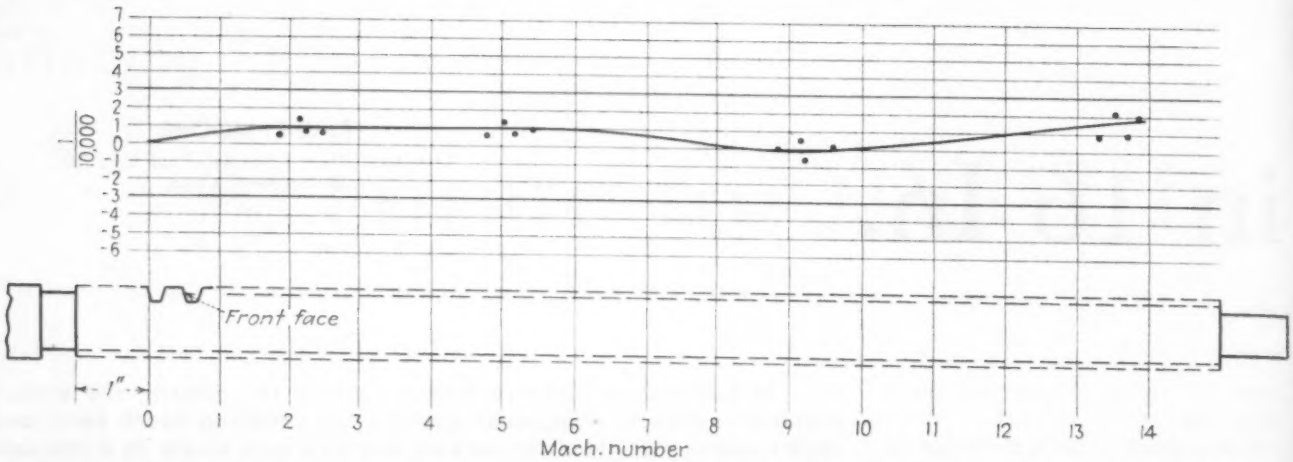


FIG. 11—Typical graph of errors as plotted for each lead screw. Average errors as shown by a large number of these graphs are used as the basis for cutting the serrations in the compensator cam plate (Fig. 4).

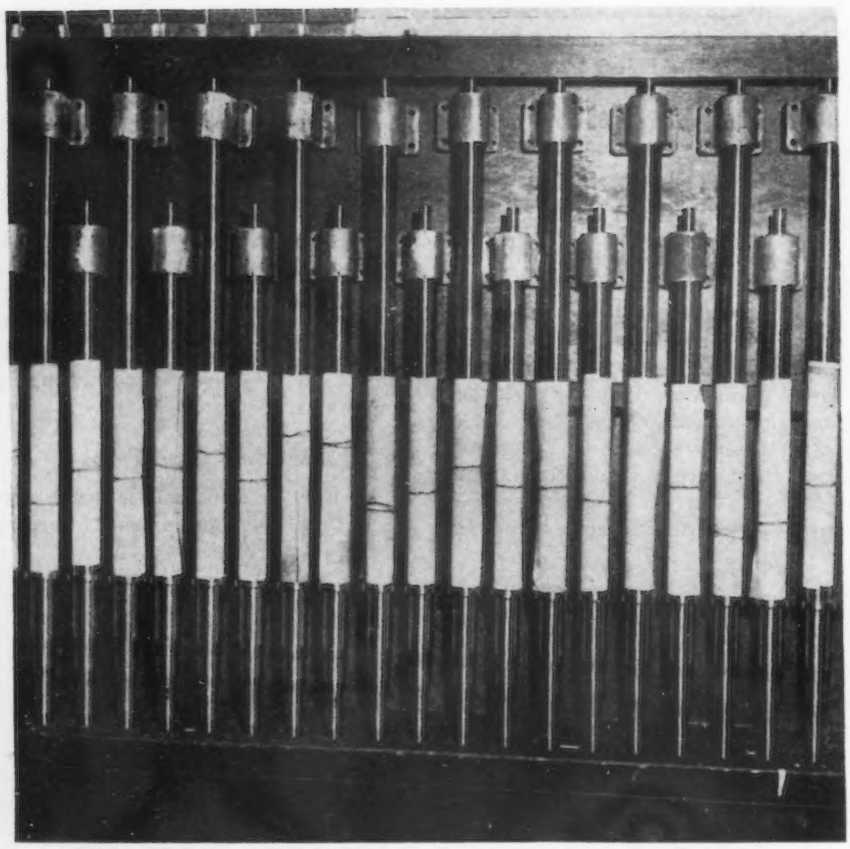


FIG. 12—Batch of lead screws, finish ground, fitted to nuts, in storage rack. Blue print wrapped around each screw is chart of errors, Fig. 11.

is made for every lead screw produced. These charts are filed for future reference. The chart is simply a graph and takes a form approximately like that shown in Fig. 11.

Errors are always charted beginning with the zero end of the screw. Readings are made in four different places around the screw, to eliminate the possibility of large errors in reading due to lack of concentricity, stagger or rough finish.

Average errors from a large number of these charts can be plotted on the compensator cam plate of the thread grinder to correct whatever aperiodic errors may develop in the master lead screw.

Every precaution must be taken to prevent dimensional changes from taking place after the workpiece is finished. For this reason, roughing and finishing are not carried out as one continuous process. Two roughing operations are made before the final grinding. Internal stresses are removed by artificial ageing between successive operations.

Combination Thread Form

As a further precaution, an ingenious combination of thread forms is ground, in order to avoid touching the root of the thread during final grinding, Fig. 13. The first roughing operation consists of grinding a steep-sided thread somewhat deeper than the nominal thread depth, but with the width at the nominal depth the same as it would be if ground only to nominal depth. After artificial aging the screw and regrinding the outside diameter, the thread is rough ground to the correct thread angle, but not to full width. Following another aging operation, the final grinding is done. For this operation, the wheel is dressed to a form

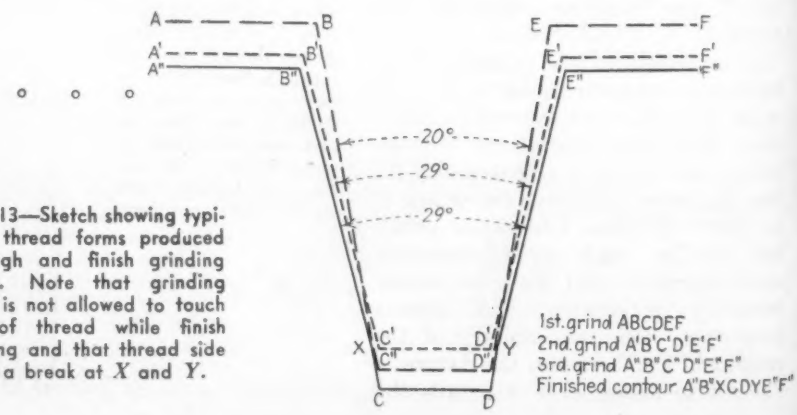


FIG. 13—Sketch showing typical thread forms produced in rough and finish grinding stages. Note that grinding wheel is not allowed to touch root of thread while finish grinding and that thread side has a break at X and Y.

which will go past the nominal depth, but not to the depth originally ground. In this way, the danger of grinding a "step" in the bottom of the thread is eliminated; yet the *flanks only* are ground during the final operation.

Checking Table Movement

It is not to be assumed, merely because the screws check accurately by the methods herein outlined, that the table will move accurately. Conditions of mounting in the machine, misalinement, etc., will affect the process by which the screw moves the table. Therefore, final checking for lead accuracy is done under operating conditions when the screw is actually assembled in place.

Standard gage blocks are not as a rule sufficiently accurate for this purpose. Usually gage blocks are accurate as to length, but the gaging surfaces are not perpendicular to the sides of the blocks. Blocks used for this purpose, Fig. 14, must have end measuring surfaces sufficiently perpendicular to their sides that they will wring together when laid end-to-end on a surface plate.

Apparent defects in lead shown by this check are usually caused by a slight misalinement of the screw and its mating nut, caused by either radial or lateral displacement between the two. The difficulty of attaining perfect alinement between these parts introduces a new set of problems which raise the following questions:

In what manner does misalinement affect lead?

How can misalinement be prevented?

If misalinement cannot be prevented, how can the thread form be designed to minimize its effect?

What compromises may be permitted from the most desirable thread form in order to facilitate manufacture?

For the effect of misalinement on lead, see Fig. 15. At A is shown a screw perfectly alined, with the movement of the nut following exactly the lead of the screw. At B, however, is shown a screw improperly alined. The "sag" of the screw has now pushed the nut past its normal position by an amount proportional to the tangent of the thread angle plus an amount proportional to the tangent of the helix angle of the thread.

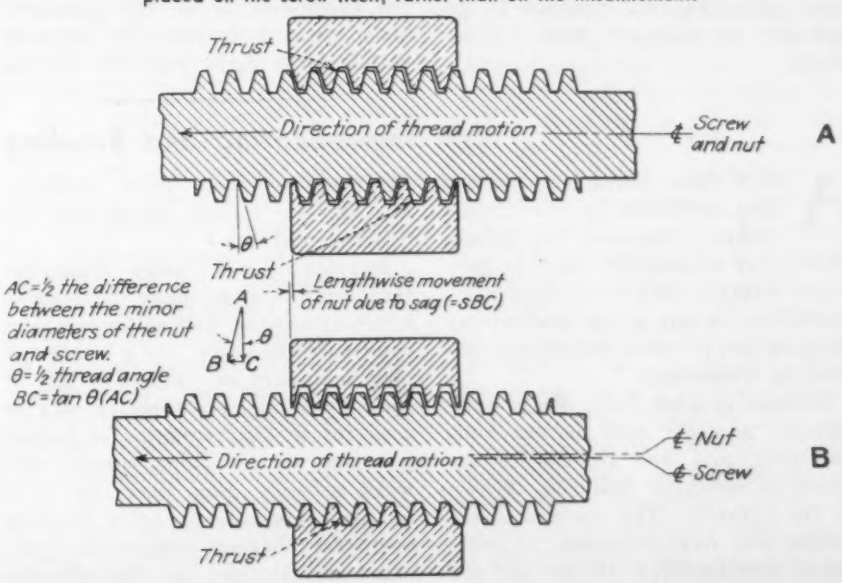
Effect of "Sag"

The "sag" and its accompanying lead error can be eliminated in any of several ways, all of which have their advantages and disadvantages:

FIG. 14—Method of checking lead accuracy of entire screw, nut and table assembly. Gage blocks are used as final proof of accuracy, although they are not used during actual operation of the jig borer.

1. The screw may be supported on a tight-fitting pitch diameter. This has three distinct disadvantages:
   (a) It is nearly impossible to make a perfect, tight fitting screw and nut.
   (b) There is a wedging action between the screw and nut, resulting in heavy friction between them.
   (c) The rate of wear due to this condition is high, especially under heavy loads; the screw eventually becomes loose and sags.
2. The screw may be supported on

FIG. 15—(A) Screw perfectly alined in nut. Note that entire front face of screw is in contact with nut. In this condition forward movement of nut exactly follows lead of screw. (B) Effect of improper alinement. "Sag" causes nut to move forward from its normal position and results in inaccuracy. Blame for this is often incorrectly placed on the screw itself, rather than on the misalinement.



a loose-fitting pitch diameter, as illustrated at A in Fig 15, provided there is sufficient constant pressure against the nut to force the screw to remain in its center. This method is satisfactory when moving heavy loads. An example of this is the Jones & Lamson thread grinder. The pressure required to move the heavy table, gear box, headstock, and tailstock is sufficient to prevent sag. In this case, the 60 deg. thread form is probably best, since less axial pressure is required to maintain concentricity than with the 29 deg. Acme or the square thread. On the other hand, this method is not satisfactory when pushing light tables, as in the Moore jig borer, since the axial pressure is not sufficient to maintain good concentricity.

3. The screw may be supported in the nut on its major or minor diameter. One disadvantage of this method is the difficulty of producing a screw having perfect concentricity between its pitch circle and its other diameters. The screw, therefore, would run eccentrically, resulting in lead errors. A further disadvantage is that, regardless of the precautions, dirt or burrs could get between the corners of the screw and nut, impairing the accuracy and promoting wear.

4. The screw may be supported on journals concentric with the pitch circle. This method is satisfactory for practically all applications, except that the mounting of the journals is too expensive for all but high precision jobs. It is probably the most satisfactory high precision design, especially for light machines.

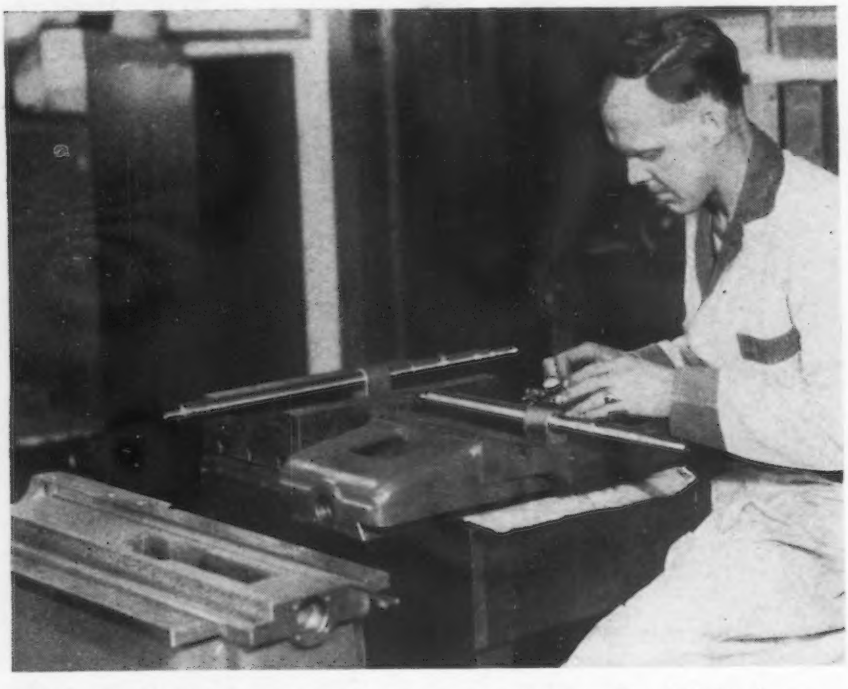


FIG. 16—Checking alinement of lead screw in nut at assembly. Height of screw from bearing ways on saddle must be equal to height from ways on base of machine. Precision gage blocks are used to transfer this measurement to the screw.

Another solution to the misalinement or sag problem is to permit the sag to exist, but to design the thread form to minimize its effect. In a previous paragraph, it was pointed out that two different angles are responsible for lead errors—the thread angle and the helix angle. Since the helix angle is small, the thread angle produces by far the greatest effect. At first glance, it would appear that a square thread would eliminate practically all the error.

While this theory is correct, it has serious limitations. A large part of its value is lost by virtue of the fact that, unless it is accurately alined, only one side of the nut will be in contact, promoting rapid wear. Furthermore, it must be alined by the most expensive method, that of two journals on the ends of the screw. The greatest drawback is that the square thread is the most difficult of all thread forms to manufacture by any method and practically impossible to grind, since it allows no clearance for the grinding wheel at the flanks.

It is believed that the most practical compromise, all things considered, is the Acme thread form, supported by journals on both ends. This is the design finally adopted for use in the Moore jig borer and Moore jig grinder. Because of the steepness of the flanks, the effect of misalinement is much less when using Acme than when using a 60 deg. form and it is much less difficult to manufacture than the square or buttress thread.

Every precaution must be taken to assure good alinement. In the Moore plant measurements are made from all sliding ways with gage blocks and transferred to the screw with indicators, resulting in final alinement within 0.0002 to 0.0003 in. Fig. 16 illustrates the great care used in performing this operation.

New Impregnating and Bonding Resin

A NEW resin, called Duralon, has been developed by the United States Stoneware Co., Akron, which it is claimed has such properties as virtually zero water absorption, insolubility in any of the present-day solvents, and presents interesting features in workability.

Duralon is made from waste agricultural products such as oat hulls and corn cobs and belongs to the group of synthetic materials known as the furanes. The manufacturers believe they have overcome the problem of stabilization in storage and are now making their resin currently available for limited commercial and experimental use.

Duralon resin is readily soluble, before activation, in many inexpensive hydrocarbons, as well as ketones and chlorinated solvents. As a solution it may be applied as coatings by any of the conventional processes, or may be used for the impregnation of porous materials such as stone, cement, plywood, asbestos, glass fibers, or other fibrous materials, or as a bonding agent for abrasive compounds, powdered metals, etc., or for adhesive bonding of fibrous materials to each other.

In its pure form Duralon is a heavy viscous liquid, dark maroon in color. On incorporation of catalysts and application of mild heat, it reverts to an extremely hard, dense, black substance that can be readily machined.

The resin can also be used as a modifying agent in oil paints and other synthetic resins, as well as a casting material for the making of mechanical and electrical parts where its water and solvent resisting properties are important.

Hot Pressing and Sintering Of Carbide Powders

ABILITY to produce cemented carbide parts too large to be sintered in available furnaces—as well as special, thin-walled parts that tend to go out of round when sintered in the regular way after pressing—has been made possible at Carboloy Co., Inc., Detroit, by the development of a "hot press" method which incorporates in one operation the three processes of pressing, semi-sintering and sintering.

The hot pressing method of producing large carbide parts, some of which weigh up to 100 lb. or more for the carbide alone, is proving so successful that it is believed that after the war carbide forming dies for turning out such deep drawn articles as kitchen ware, headlamp ware, headlamp shells, etc., can be manufactured economically by hot pressing.

The procedure, which employs electrical resistance heating to obtain the necessary sintering temperature, makes use of an hydraulic press capable of exerting a forming pressure of 100 tons (see Fig. 1). This press is equipped with water-cooled platens and is very similar to a press welder. Heat is supplied through a 750 kva. transformer and is controlled by General Electric electronic contactors. The press now in regular operation at Carboloy handles jobs up to 100 sq. in. in cross-section, although this is limited at present to an 18 in. dia. Maximum height of work which can now be handled is 8 in.

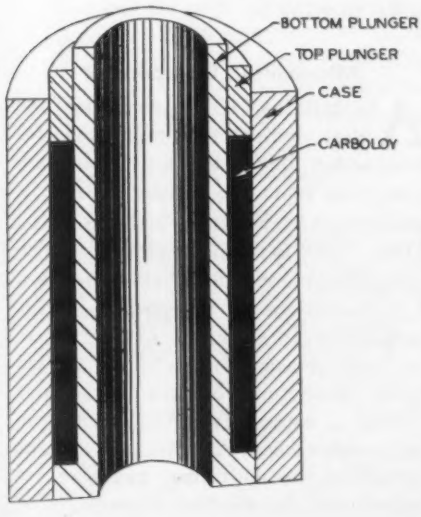
The molds in which the parts are pressed and sintered are of a graphite-base composition. The molds for dies, for instance, are composed of an outer case, an inner core, and a ring to squeeze down the carbide powder between them, Fig. 2. In machining these graphite-base molds, carbide tools are used throughout since the bonding material is highly abrasive.

When fabricating the larger die nibs, the mold with its content of metal powder is often preheated in a portable furnace. This auxiliary heating unit has a hydrogen atmosphere to protect both the graphite mold and the molybdenum heating wires. When the pre-heating is finished, the furnace together with the mold containing the metal powder is pulled from its position to a location directly underneath the press platen by means of a steel cable. Usually, the preheating furnace is left running during the entire process of hot-pressing so that the heating operation is actually continuous.

Hot pressing of large die nibs is necessarily a relatively slow process to assure even heating throughout and to keep the current density within practical limits. During the process, two pressures are used. The superimposed final pressure is effective at approximately the final sintering temperature. At the beginning of the operation, the pressure head travels fairly fast but slows down considerably as the compression increases. For this reason, the final ⅛ in. of movement is under the higher pressure. After sintering, each finished piece is checked thoroughly for density and hardness.

FIG. 1—Hydraulic press used at the Carboloy Co. for the hot pressing of carbide powders in making large carbide parts. An electrically heated muff surrounds the graphite composition mold.

FIG. 2—Typical mold for a large cemented carbide die nib. The volume of material charged must be carefully calculated since the density of the finished piece depends upon how much material there is in the carbide part when the top plunger is brought flush with the case top.



Included among the parts which are now being produced by this method are long, thin hollow pieces such as shell nosing dies for 90 mm. and 105 mm. shells; tapering and casing dies for the same caliber ammunition, and broaching rings for finishing aircraft engine silver lined bearings. The rings for these broaches must be extremely thin and entirely free from porosity.

Electrolytic Polishing Prior to Plating

IN a newly developed procedure for chromium plating metals such as steel parts for linotype machines, electrolytic polishing in a solution containing a small amount of glycerine is used, according to U. S. Patent 2,327,676 granted to J. W. Spence.

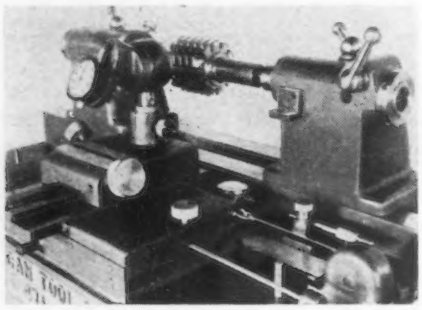
According to the specifications, the material to be plated is placed in a boiling cleaning solution in which it is alternately made cathode and anode. After removal from this solution the material is rinsed and then treated as an anode in a bath containing 66 per cent sulfuric acid, 5 per cent glycerine and water. It is then electrolytically plated with chromium in a chromic acid plating bath while heated, and then placed in a mass of slowly cooling molten material such as lead. Intermediate coatings of cobalt, copper or nickel may be used.

New Equipment . . .

Small Tools and Gages

. . . New developments in gages, inspection tools, markers and fasteners are described in the following pages.

A SINGLE machine (Model 471), designed to completely check the correct resharpening of hobs or milling cutters, is being marketed by the *Michigan Tool Co.*, 7171 East McNichols Road, Detroit. Hobs of milling cutters with a maximum o.d. of 10 in. and 8 in. length, arbor or shaft length maximum 16 in., may be checked for spacing of flutes (either parallel or spiral gash), rake angle,



parallelism of straight flutes, taper on the o.d. and concentricity of proof diameters by means of two standard interchangeable indicator assemblies. Two additional interchangeable indicator assemblies are available for checking lead of hob or spacing of threads in multiple thread hobs, measured in a plane parallel to the axis of the hob and for checking depth of tooth of topping hob.

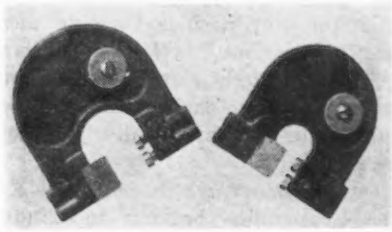
Optical Flats

DoAll optical flats manufactured by *Continental Machines, Inc.*, 1301 Washington Avenue South, Minneapolis 4, are made from fused Brazilian quartz which has a hardness of seven on the Moh scale as compared to with six for optical glass. By having a lower coefficient of expansion the DoAll flats can withstand an amount of handling and remain flat. Six sizes in diameters of 2, 3, 4, 5, 6 and 10 in. are available, each flat being packaged in a convenient hardwood case. They are available with the folowing grades of accuracy: 1 millionth in. accuracy for laboratory gage blocks and instrument inspection, and 2 millionths in. for checking instruments and fine tools. For use with these flats Continental Machines, Inc., offers its DoAll Monolight using helium light rays which produce fringe or interference hands of 11.6 micro-in. By these bands it is possible to measure flatness, height and parallelism with extreme accuracy.

Mobile Inspection Unit

TO meet the situation where measuring tools and parts are sent to the inspection department for checking thus requiring short shutdowns and delays, the *Continental Machines, Inc.*, 1301 Washington Avenue South, Minneapolis 4, offers its DoAll mobile inspection unit which is wheeled right up to the point of work. This abbreviated inspection department contains

all the necessary instruments and gages to certify the work progress. This unit occupies 7 sq. ft. of space and can be locked up to protect the measuring instruments and the records kept by the inspector. The measuring instruments and gages provided in the unit are as follows: optical flat and source of monochromatic light, a set of 83 DoAll gage blocks having an accuracy of ± 0.000004 in.; a new DoAll comparator gage and 20 different precision measuring instruments.

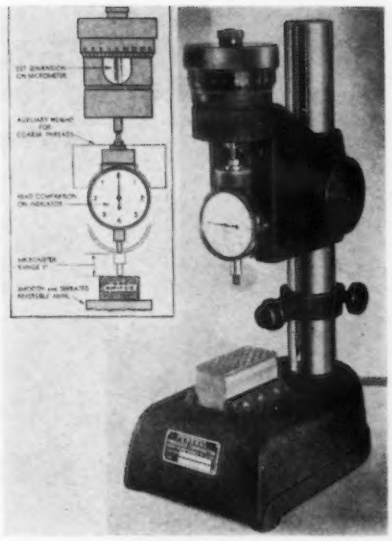


Midget Gages

FOUR models of adjustable limit snap gages, known as midget type gages, have been added to its line by the *George Scherr Co.*, 128 Lafayette Street, New York 13. They are manufactured in accordance with American gage design standards and are designed for checking and inspecting extremely small and delicate parts. They can be set to handle work from 0.000 to 0.760 in.

Micrometer Comparator

A COMBINATION micrometer and dial indicator comparator for production inspection and miscellaneous tool room use, Model 120B-1, is announced by Federal Products Corp., 1144 Eddy Street, Providence. The micrometer head eliminates the need for a complete set of gage blocks for setting the dial indicator to the required dimension. Inspection of thread pitch diameters by the three-wire method is especially facilitated by the micrometer head. An auxiliary weight furnishes the additional pressure required for the coarser threads. The

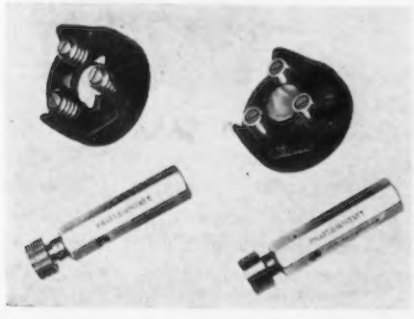


use of 1 and 2 in. gage blocks (furnished as extra) enables the setting of the gage by means of the micrometer to any dimension within 4 in. vertical capacity (total capacity 8 in.).

Pipe Thread Gages

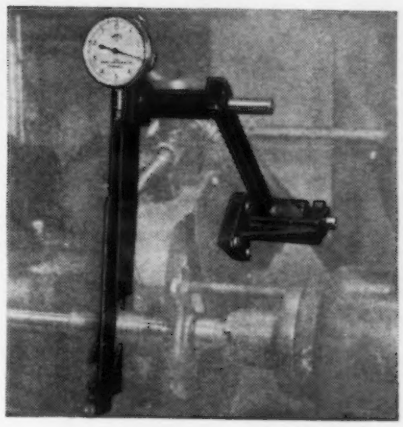
A NEW line of gages offered by *Pratt & Whitney, Division Niles-Bement-Pond Co.*, West Hartford, Conn., will give a rapid, accurate check on pipe threads. For checking the accuracy of internal threads there is the double-end gage, carrying the L1 and L3 thread plug gages which check lead, form, diameter and taper. A plain taper plug gage checks taper, roundness and minor diameter. The L1 and L3 plugs have three steps for classifying the thread, while the plain taper plug has six.

For checking external threads there is a set of two special Tri-Roll gages. The first checks the lead, form, taper and pitch diameter. Three steps on the top of the gage classify the thread. The second is a plain taper Tri-roll gage for checking taper and diameter of threads at crest. This has a stepped plunger and three steps on bottom of gage for easily classifying thread. A setting plug is supplied with each of these special Tri-roll gages.



Micromatic Grinding Gage

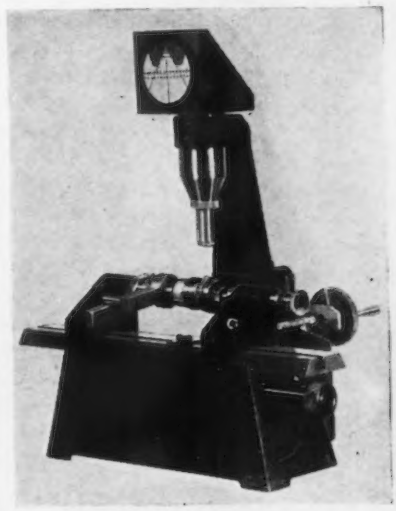
THE Stuart micromatic visual grinding gage is being distributed by *Clawson & Bals, Inc.*, 4701 West Lake Street, Chicago. It is applied to and taken off the work while the machine is in operation, eliminating hand "miking." The dial indicator guides the operator as the work is ground to size. The gage indicates the correct size even though the sizing controls of the machine may be worn. Grinding tolerances of ±0.0001 in. are easily maintained.



Surface Inspection Plate

FOR precision inspection of flatness, the *George Scherr Co., Inc.*, 128 Lafayette Street, New York 13, offers its new, optically polished glass surface plate, known as Opti-Flat, of an accuracy guaranteed within 50 millionths in. over a 16 in. surface.

The Opti-Flats are highly resistant to abrasion and in order to lessen possibilities of warpage and breakage are made 2 in. thick for the 12 in. size plate and 3 in. thick for the 16 in. size. Opti-Flats are annealed so that they are free from strain and will not distort over a period of years.



Thread Pick-up Projector

A THREAD pick-up projector has been announced by *Acme Industrial Co.*, 200 North Laflin Street, Chicago 7, which is an optical device for pre-setting the driving dog on pre-threaded work so that when such work is placed in the grinder, the grinding wheel enters the trough of the oversize thread to remove finishing stock from both flanks without further adjustment. No time is lost in the operation since it is performed on each piece while preceding piece is being ground.

Slot Thickness Gage

A GAGE for the measurement of slots and thicknesses has been designed by the *Metrical Laboratories, Inc.*, 417 Detroit Street, Ann Arbor, Mich. They use the flow of air as a measuring medium and operate in conjunction with the single position Metricator which is used to indicate size variations. The Metricator instrument is graduated in 0.00005 in. and can be read accurately to 0.000025 in.

Precision Gage Blocks

IN order to meet the needs of tool and die designers whose budget prevents their purchase of larger sets of gage blocks, *Continental Machines*,

Inc., 1301 Washington Avenue South, Minneapolis 4, has made available a set of 37 gage blocks in a pocket size carrying case. These blocks when wrung together give any measurement from 0.05 in. to 11.7995 in. in increments of 0.0001 in. These gage blocks come in two qualities sets: set "A" is of inspection quality and is guaranteed in height, flatness and parallelism accuracy to within ±0.000004 in. at 68 deg. F., and set "B" is of working quality and is guaranteed in height, flatness and parallelism accuracy to within ±0.000008 in.

Dimension Checker

TO automatically check the dimensions of all production parts individually, a device has been placed on the market by *Interlakes Engineering Co.*, 502 Transportation Bldg., Detroit 26. The "Check-Matic" provides automatic inspection of parts up to 1½ in. in diameter and 2 in. in height, checking "go" and "no-go" on such dimensions as outside and inside diameters, depth of counterbore, wall thickness and depth of holes, all to limits of 0.001 in.

Gage Block Set

A PERSONALIZED set of chromium plated gage blocks of toolmakers who want their own individual set of standards for checking purposes has been announced by the *Dearborn Gage Co.*, 22038 Beech Street, Dearborn, Mich. Each set consists of six blocks in sizes 0.0625, 0.125, 0.250, 0.375, 0.500 and 1 in., contained in a hand rubbed walnut case.

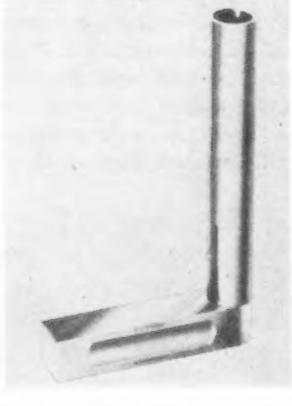
Comparison Standards

A SET of surface finish comparison standards which enables manufacturers to specify and check surface roughness has been devolped by the *University Machine Co.*, Cambridge, Mass. The set is composed of 23 specimens with a roughness

range from 2 to 500 millionths in (rms). The blocks include specimens of all ordinary machine tool operations, such as polishing, grinding, turning, shaping, milling, etc. Each specimen is engraved with the machine operation and micro inch reading.

Master Square

MADE to gage block standards, the Ellstrom master square has been made available for precision industrial uses by the *Dearborn Gage Co.*, 22038 Beech Street, Dearborn, Mich. The upright member is in the



form of a cylinder, which is screwed to the base. As wear develops, a fresh new surface can be brought into use by turning the cylinder slightly. All surfaces are hard chromium plated, lapped to finish accuracy of 10 micro in.

Air Gage Spindle Standards

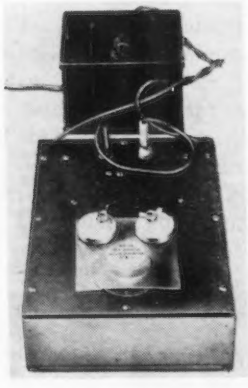
TYPE and size standards of air gage spindles for dimensional inspection of internal diameters and bores have been established by the *Sheffield Corp.*, Dayton 1. Standards have been set up on "Precisionaire" spindles for checking either "through" or "blind" holes ranging in diameter from 0.300 to 1.734 in., with tolerances from 0.005 to 0.00005 in. or less. All spindles within certain size ranges may be used on Precisionaire instruments of corresponding tolerance range. Additional standards are being prepared.

Rust Preventive for Coolants

A PRODUCT which is added to clear water and water soluble cooling cutting oil to prevent rust is being marketed by *Machinery Supplies Co.*, 501 Madison Avenue, New York 22. The liquid works while various operations are performed and dries up by itself, forming a tight but invisible film which fills up the finest pores of the metal surface without affecting the measurable height. The product is called Ru-Pre-Sol.

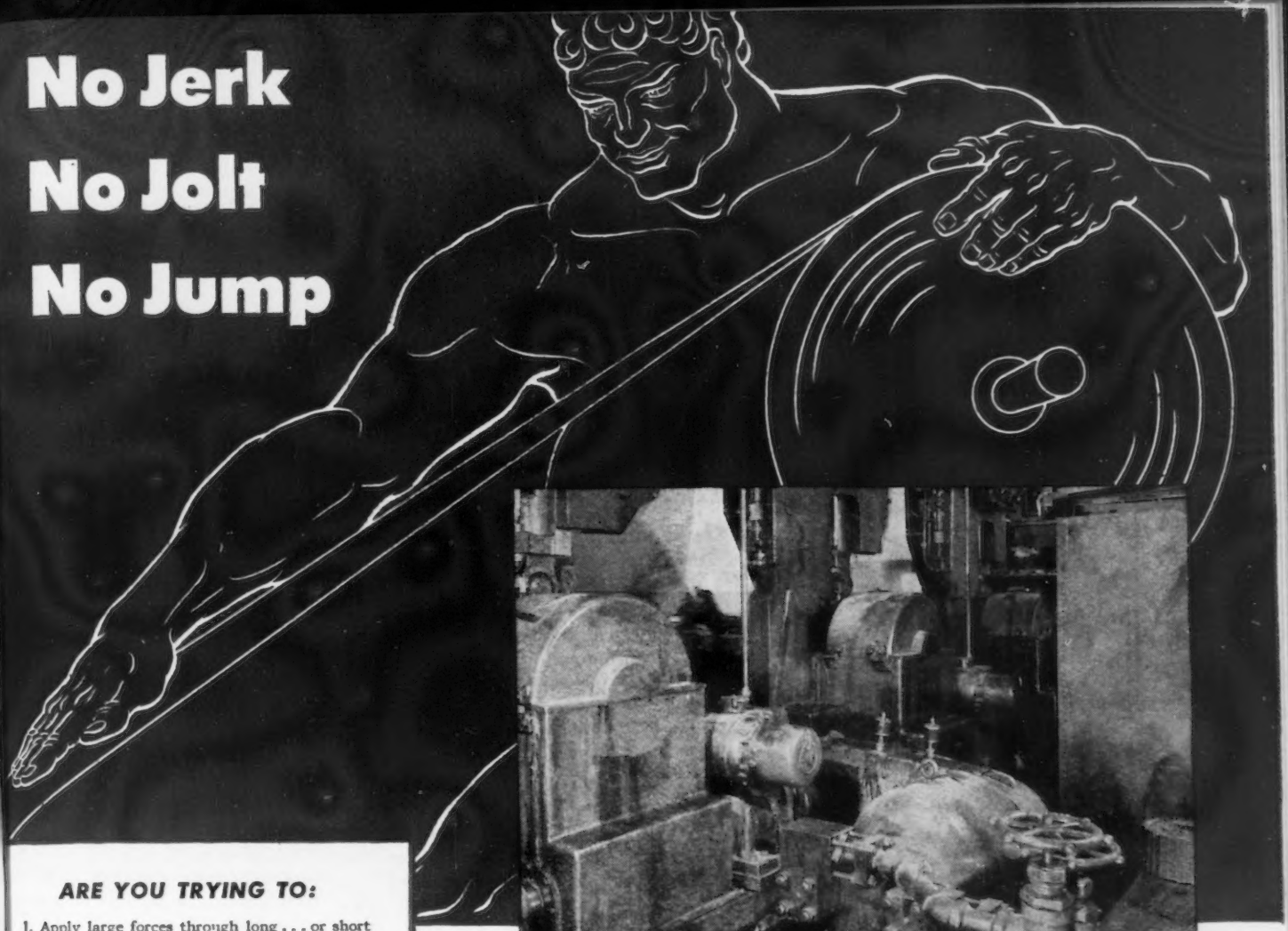
Electrolytic Marker

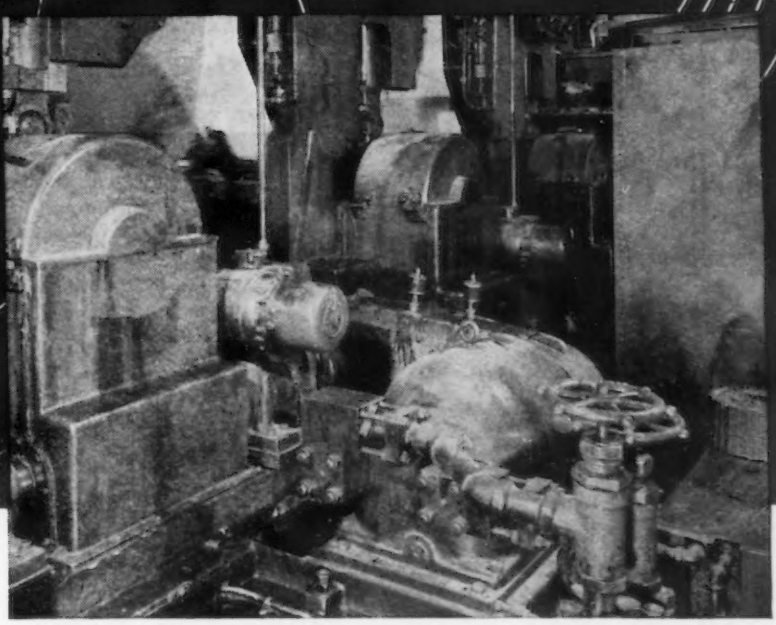
AN electrolytic method of marking metal, yielding 1200 to 1500 impressions per hr., is announced by the *Acme Metal Marking Equipment Co.*, 2222 West Fort Street, Detroit 16. The Met-L-Etch consists of a compact unit 2 x 6 x 9 in. with a 110 volt a.c.



transformer. Names, numbers, trademarks, inspection symbols and other data are quickly and permanently etched on smooth metal surfaces without the use of acid, and without any special preparation or cleaning or neutralizing after being marked.

No Jerk
No Jolt
No Jump





ARE YOU TRYING TO:

1. Apply large forces through long . . . or short . . . strokes at variable speeds?
2. Obtain automatic work cycles, variable speeds in either direction . . . with or without pre-set time dwell?
3. Apply large forces through continuous or intermittent reciprocating cycles at constant or variable velocities?
4. Obtain extremely accurate control of either position or speed of a reciprocating member?
5. Apply accurately variable pressure either static or in motion?
6. Closely synchronize various motions, operations or functions?
7. Apply light . . . or heavy . . . forces at extremely high velocities through either long or short distances of travel?
8. Obtain continuous automatic reversing drives at constant R.P.M. or over a wide range of speed variation?
9. Obtain accurate remote control of speed and direction of rotation, rates of acceleration and/or deceleration?
10. Obtain constant horsepower output through all or part of a speed range?
11. Obtain automatic torque control?
12. Obtain accurately matched speed of various rotating elements?
13. Obtain constant speed output from a variable speed input?
14. Obtain full pre-set automatic control, elimination of problems of shock, vibration, etc.?

You Need Oilgear!

OILGEAR

An Oilgear Plus: Oilgear also enabled Neo Gravure to discover for the first time the correct pressure to use on their impression cylinders. Result: longer sustained quality, longer roller and cylinder life.

The Famed Oilgear *"Glide"* May Solve a Drive Problem for You

To print an entire magazine in 4 colors, on both sides of the paper, in one pass through a huge rotary press requires an unbelievable miracle of smoothness and synchronization. But the Neo Gravure Printing Company of New York and Chicago weren't getting the miracle. They got spoilage, waste and delay instead. So they turned, as many another company or machine designer in trouble has turned, to Oilgear Fluid Power. That was in 1934, then 1936, then 1937 and 1939. For they found that Oilgear accelerated their presses as "smooth as silk" from zero speed to maximum . . . synchronized all press units in lock-step . . . gave a new precision control, hundreds of feet more floor space, and a performance which became a new standard for the industry.

The famed Oilgear stepless acceleration is just one of the dozens of remarkable functions this remarkable system can bring to your machine design problem. Maybe you want tremendous power in small space . . . power around corners where belts and gears can't reach . . . a combination of rotary and linear motion. Maybe you need something you haven't thought of. Why don't you consult Oilgear engineers' broad experience and see what Oilgear versatility can do. Now is the time to write. . . . THE OILGEAR COMPANY, 1503 West Bruce Street, Milwaukee 4, Wisconsin.

OILGEAR

Fluid Power

Assembly Line . . . STANLEY H. BRAMS

• Contract termination problems threshed out by industry in meeting with Army and government men . . . Desirability of prompt filing of claims stressed at Detroit . . . Packard is permitted to bring prewar facilities out of storage.

DETROIT—The automobile industry appears to be developing increased confidence in Washington's efforts to clear away the log jam of contract termination problems. That was the attitude over the weekend following a day-long meeting on termination problems last Friday, during which Congressional and Army representatives bespoke their realization of the significance of the problem. This increasing realization in official minds, a healthful development for all American industry, is probably due to the energetic work of the automobile people and their War Council as much as to anything else.

Whether official or not, Col. David Hauseman, director of the Army Service Forces Readjustment Division had some interesting figures to report on the effect on production of war's ebb and flow. There is "some" belief, he declared, that when Germany is knocked out, 25 to 40 per cent of present output will be cut. "If necessary termination of contracts becomes bogged down in red tape and fiscal detail," he stated, "and if plants needed for strategic production become choked with dead surpluses, the war will suffer."

Thus far, he reported, about $4,500,000,000 in cancelled contracts have been settled. Of these, $2,500,000,000 were cleaned up without claims having been filed. On the remainder, claims of $171,000,000 were filed for unfinished work, and payments made on these aggregated $133,000,000. This indicates, as Col. Hauseman pointed out, that claims on terminated contracts average somewhat under 10 per cent of the face of the contracts. For interim periods, he said, the Army believes "in partial payment and loans to industry up to 90 per cent of the amount of the claim."

In addition, some $6,000,000,000 in other fixed price contracts have been terminated, on which, at the nearly 10 per cent claim expectancy, some $500,000,000 in claims will probably be forthcoming. But up to May 1, only $131,000,000 in claims had been filed—around a fourth or so of the sums probably involved.

This, said the colonel, came as somewhat of a surprise to the Army. It indicates that industry must speed up its claim filing. The war department, he said, is prepared to pay for the cost of materials purchased and for work in process, together with a "reasonable profit." But before any such action can be taken, the claims must be filed. Some, he declared, are still missing on contracts terminated six months ago.

IN addition to the fixed price contracts terminated, about $3,000,000,000 in cost-plus fixed-fee contracts have been finished up. He did not indicate the extent of incompletion in these CPFF deals, but obviously they can be expected to bear more lightly on industry's position than do the fixed price arrangements.

Involved in these contract terminations, as the speaker pointed out, is the problem of surpluses. He stressed that the War Department cannot acquire and hold surpluses, that war plants cannot be piled up with them, and that warehouses must not become "burying grounds" for them. He urged quick sale of surpluses to get them back into trade channels, and called for "bold and courageous decisions" on scrapping unusable material without quibbling or hesitation.

A legislative viewpoint on the outlook was forthcoming from Congressman William M. Colmer, chairman of the House Committee on Postwar Economic Policy and Planning. He outlined the six-point platform of his committee:

1—Insure continuation of free enterprise and bring about, as far as possible, the cessation of wartime regimentation.

2—Seek new markets, foreign and domestic, for increased production necessary for full employment.

3—Study demobilization problems effects of unemployment.

4—Arrive at a proper program of federal, state and local public works extent necessary to absorb employment slack.

5—Analyze federal statutes to determine what will retard and what will successful postwar reconversion.

6—Recommend to Congress a tax program which will bring in revenue to carry on necessary governmental functions and still not prohibit return of profits essential as an incentive for risk capital.

In general, this speaker declared that national income after the war must be increased 35 or 40 per cent over the 1940 level of $90,000,000,000, raising it to about $125,000,000,000 and thereby providing employment for 53,000,000 persons. This will be essential, he said, if only in order to meet a likely interest burden of $7,000,000,000 a year or so on the postwar national debt.

Meanwhile, at Packard Motor Car Co., a subtle signpost along the reconversion road was being erected. Packard has been given authorization by the WPB Facilities Division to proceed a $975,000 project to provide additional facilities for war production replacement parts requirements.

The significance in this award is that $546,228 is earmarked for the installation of existing idle machinery and equipment. This equipment was in prewar use for parts production and at the start of the war was dismantled and stored. Technically, reactivation was allowed in order to fill military orders, with only 10 per cent of total output usable for civilian replacement requirements.

BUT in actuality, the effect of reactivation is to give Packard that much preparation for a start to passenger car output. Packard, like other smaller auto makers, has been facing the handicap in the coming reconversion race of having to bring such production equipment back into its shops, set it up and get it running. Larger makers, equipped with heavier replacement part commands, in many cases kept their assembly lines running.

WPB evidently recognized that Packard had a case, but was obviously in no position to give any one company a head start. But when Pa

Are Your PRECISION GAGE BLOCKS *Still Safe to Use?*

All Precision Gage Blocks have one thing in common . . . they eventually wear. New blocks are made accurately within a few millionths of an inch. That is why you bought them . . for use as dependable master standards.

But only a little wear on a few of the most often used blocks can change a whole set into a potential source of dangerous errors when you use these worn blocks to set the working gages that in turn govern your whole production accuracy. That is why we recommend periodic expert inspection of your Precision Gage Blocks . . . a sure way to safeguard the source of Accuracy for your whole inspection system.

Regardless of Where You Bought Them . . . The Answer is . . .

PRATT & WHITNEY INSPECTION of your PRECISION GAGE BLOCKS

Here is how it works . . .

1. Send your blocks to our factory at West Hartford, Conn., with an order to inspect them.
2. Each block is individually cleaned, and all burrs, bruises or scratches are carefully stoned.
3. Each block is inspected for flatness, parallelism and length in our constant temperature room by our gage experts, using our extremely sensitive measuring equipment.
4. Our exact readings on each block are listed in an Inspection Certificate, plus our inspector's recommendation of replacement when he finds any block so worn or damaged as to be unsafe for use.
5. This Certificate is returned to you.
6. You then instruct us to either replace dangerous blocks with new ones from our stock, or to return your set "as is."
7. If you instruct us to replace worn blocks we will do so at individual block prices, and return your set in first class condition.

In this vibration-free, constant temperature room Pratt & Whitney Grand Masters are checked and calibrated by an interferometer. Periodically these Masters are sent to the National Bureau of Standards for additional checking. Every gage block sent to P&W for inspection is individually checked against these Masters.

For full information on new sets of P&W Hoke and USA Precision Gage Blocks, write on your letterhead for the Pratt & Whitney booklet "± Millionths."

PRATT & WHITNEY

Division Niles-Bement-Pond Company

WEST HARTFORD 1, CONNECTICUT

was able to prove that its inventories have been stripped and back orders are on hand, and when need broadened for critical spares of other makes, then a reasonable basis existed to permit reestablishment of the facilities. This is the face indication of the situation; WPB does not confirm it but by its very silence gives evidence of the underlying factors.

Now being set up, the facilities will permit manufacture of parts for Packard and other companies, both for original equipment and replacement use. The capacity developed will be used for such basic automotive parts classifications as crankshafts, cylinder blocks, valves, camshafts, heads, connecting rods, rear axle shafts, steering knuckles and front end suspensions.

Along with the authority to bring the manufacturing facilities out of the warehouse, Packard was allocated $294,772 which provides for opening of a machine shop area, an award which further points to the consideration WPB is giving on reconversion requirements. The rest of the money will put into operation a portion of the existing cast iron foundry, at cost of about $54,000, and the installation of facilities to remove a bottleneck in scrap handling in current manufacture of aircraft and marine motors, for about $80,000.

Foundry needs continue to be the prime problem in parts needs for original equipment, and Packard's newly authorized casting capacity will go rapidly to work as soon as it is available. The word has been reported passed down the line from Washington to do everything to make possible added casting production, by means of facilities authorizations, prompt handling of any labor disputes which arise, and whatever other steps can be taken.

Buffalo Controlled-Hiring Plan Extended to Critical Labor Areas

Washington

• • • **The Buffalo plan** of controlled hiring will be applied by the War Manpower Commission to the 183 Group I and Group II labor areas on July 1, in an effort to adjust manpower distribution on a national basis.

This means that all male workers in these areas over 17 seeking jobs must be funneled through the various United States Employment Service Offices to employers on plant priority lists to be established.

The industries which will generally take first precedence in WMC worker reference plans are: Foundries; lumbering; paper mills and ship repair yards. Other plants which will receive special USES consideration are those making the following products: Synthetic rubber; high-octane gasoline; tires and high tenacity rayon.

Regional directors working with USES and local manpower committees will determine employment ceilings for all plants within the tight areas. In the case of foundries, however, the manpower supply has been frequently as bad in Group III and IV labor areas as in the Group I and II areas. In such cases, officials are expected to cutback civilian production in the loose areas to provide workers for plants having a priority.

Some regional directors have placed women under the hiring control. Wherever employment ceilings are established, an attempt will be made to give uniform treatment to plants having the same number of workers and making the same product within an area. Whenever a company wants to hire a particular individual, company officials must get the approval of the USES office in the area where the employee works.

WMC says that it will not need to increase the personnel in USES to operate the new plan, but the modified Area Production Urgency Committees now numbering 50 in Group I and II areas, will be established in about 200 areas.

These local committees will assist regional directors and USES in local determinations of employment ceilings and plant priority and are composed of representatives of all procurement agencies, including WPB and WMC.

Labor reaction to the plan which was not favorable months ago when the Buffalo version was first started seems to have reversed itself. However, manpower officials confess that the plan cannot work unless it is supported by both labor and management, as enforcement would use more manpower than the plan promises to yield.

On the other hand, WMC has considered what it would do to a plant which refused to comply with the new rules and suggests that few concerns would care to defy the government. In the event of violations, a WMC spokesman suggests that the penalties of the Second War Powers Act could be invoked which consists of a fine of $10,000 upon corporation officials, or imprisonment or both. This official said that WPB priority assistance might be revoked in case of willful violation and the denial of worker reference by WMC.

100,000 Hydromatic Propellers Built at Nash-Kelvinator Corp.

Detroit

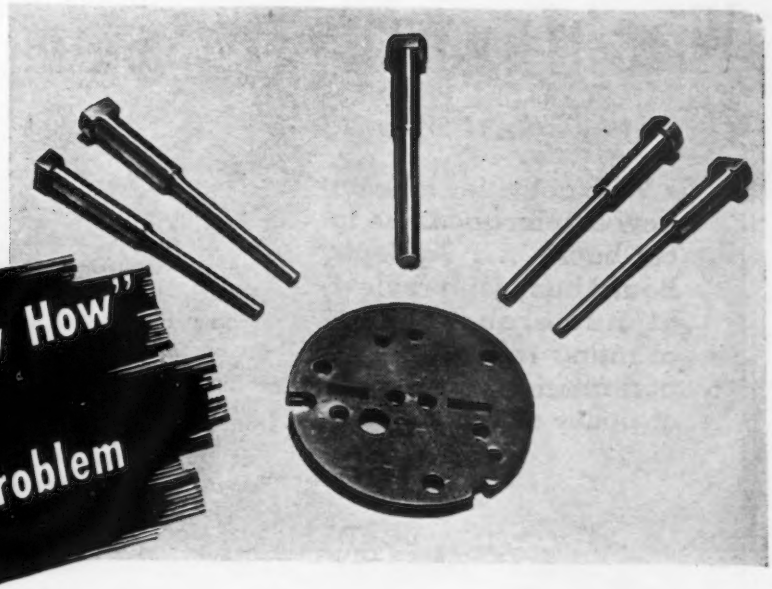
• • • **Nash-Kelvinator Corp.** has built on a mass production basis more than 100,000 Hamilton Standard three-bladed hydromatic propellers, the total turnout by its propeller division of completed assemblies in a variety of types used to supply 25 different Allied combat aircraft. This was disclosed by R. A. DeVlieg, vice-president of Nash-Kelvinator, and is the first statement of production figures to be approved by military censors. The record was established in less than 26 months of assembly line production in four of the Michigan plants.

Recently Nash-Kelvinator announced contracts calling for production of four-bladed propeller and the new R-2800-C Pratt & Whitney two-stage supercharged engine which will be used to power faster and more powerful Corsair and Hellcat fighters.

Oil Well Supply Acquires Engine Works at Kansas City

Oil City, Pa.

• • • **Oil Well Supply** Co., a U. S. Steel subsidiary, has contracted to acquire Witte Engine Works, located at Kansas City, it was announced. The Witte Engine Works will continue as heretofore in the manufacture of small gas, gasoline, and diesel engines for general use. The acquisition of Witte Engine Works will provide Oil Well Supply Co. with a line of diesel and other engines for oil well pumping units and other applications in industrial, agricultural and other fields.



How Heat Treating "Know How" Helped to Lick a Tough Hardening Problem

Here is an on-the-job story of how Carpenter tool steel and the practical knowledge of a Carpenter representative teamed up to solve a tough tool steel problem. The facts are summarized below. The tools and work involved are shown in the photograph.

THE JOB:

Punching 3/4 hard brass (Rockwell B-79), .137" and .150" thick, in a double acting 250-ton punch press. The holes to be punched vary from .099" to .167".

PROBLEM:

Preventing cracking of punches under the head during hardening, avoiding decarburization and keeping the punches straight in quenching. About 75% of the punches hardened had been cracking in the shoulder under the head in the hardening process.

SOLUTION:

The Carpenter representative, when asked for advice, made the following suggestions: First, to use the recommended furnace atmosphere of 2% to 4% oxygen. Second, to switch from a tap water quench to one of 10% brine. Third, to heat the punches in a piece of 3/4" round iron pipe (both ends open)—so that the punches can be dropped vertically into the brine to get a full quench under the head.

RESULT:

On the first try following these recommendations, some 200 punches made from Carpenter Green Label Drill Rod were hardened, using a temperature of 1450° F. with an atmosphere of 2% to 4% Oxygen. The problem was licked! Decarburization was eliminated and all were O.K. for straightness. In production they averaged 100,000 holes per punch.

• If *you* have a tool steel problem—or if you should like help in getting tools that give longer uninterrupted production runs—your nearby Carpenter representative will be glad to give you every assistance. He can supply you with helpful printed matter—he can render personal "on the spot" service—and he will keep you in touch with the Carpenter Metallurgical Department.

THE CARPENTER STEEL COMPANY
121 W. Bern St., Reading, Pennsylvania

Carpenter
MATCHED
TOOL STEELS

Washington

L. W. MOFFETT

• WPB activities take on new significance due to cut-back . . . Appeals Board busy with review of numerous orders granting relief . . . Important new questions of policy now involved.

WASHINGTON—With cutbacks creating additional manufacturing capacity, releasing manpower, and making materials available to an extent greater than ever before since the war began, the activities of WPB in connection with appeals from its restrictions on civilian manufacture take on a new significance.

Action upon appeals is primarily the responsibility of the Industry Divisions administering the orders under which appeals are filed. The WPB Appeals Board, created in July, 1942, reviews all cases in which an appellant is dissatisfied with the denial of his appeal by an Industry Division and formally requests action by the Appeals Board.

The Appeals Board also reviews proposed grants of relief by the Industry Divisions to which authority to make final grants has not been delegated. The total number of orders under which appeals may be received is about 500, and the total number of orders under which proposed grants of relief are subject to review by the Appeals Board is about 150.

In general appeals may be classified in three broad categories. They are: 1—Those which involve adjustments of quotas because of the base period selected; 2—the use of a prohibited material in the manufacture of a permitted item, and 3—the manufacture of prohibited items.

The factors generally recommended for consideration in adjusting quotas involve conditions generally beyond the control of the appellant, such as strikes, fire, acts of God, production for less than the base period, production using the permitted material at the date of the order but having no base period experience because of having used a material for which substitution had to be made.

In considering appeals in the second and third categories mentioned, the factors generally include the overall supply picture of the material involved, the production facilities, essentiality of the product under appeal, the manpower situation, undue hardship, conformity with established policies, the competitive effect, and emergency situations. In many cases appeals to use prohibited items involve the consumer more than the manufacturers, as for example, appeals involving military contracts.

An appeal is rarely recommended on the basis of one isolated factor, there generally being a combination of extenuating circumstances which provided the basis for grants of relief.

Dr. Arthur N. Holcombe, Appeals Board chairman, in his last report to WPB chairman Donald M. Nelson, noted that there are three kinds of appeals which raise important new questions of policy now occurring. One is the appeal for permission to make a prohibited article, or to use prohibited materials for making a permitted article, or to exceed a prescribed production quota for the purposes of keeping the appellant's labor force employed during an interval of reduced activities between war orders. Relief in such cases serves the double purpose of maintaining war production and protection of the civilian economy.

ANOTHER kind of appeal is that which seeks permission to reconvert from military to civilian production, when there is no expectation of further war orders. While recognizing this is a top policy question to be decided by all war agencies, temporary relief has been granted in cases where the threat of unemployment is immediate and grave, and no unfair competitive advantage is gained by the appellant.

A third kind of appeal is that of the appellant who wishes to experiment with improved models of a pro-

Miscellaneous WPB Appeals Statistics

1943 Estimated Number Appeals Filed	100,000
1944 Estimate	150,000
Average Number Orders Appealed from Weekly	160
Per Cent of Appeals Denied by Industry Divisions	20-30
Per Cent of Appeals Granted by Industry Divisions	60-70
Closed Without Formal Action	0-10
Per Cent of Appeals Acted Upon Within 21 Days	80
Per Cent of Appeals Referred to Appeals Board	20
Per Cent Reversals by Appeals Board	15

Summary of Action on Appeals by the WPB Industry Divisions and Appeals Board
April 15-May 6, 1944

ORDER	PRODUCT	Number Referred to Appeals Board	TOTAL RELIEF (NET TONS) Requested	Granted
S-4	Structural Steel Shapes	0	7,565.00	7,565.00
S-8	Carbon Steel Plates	0	905.00	905.00
M-21-e	Tin and Terneplate	0	425.56	425.56
M-81	Metal Cans, Food and Non-Food	0	13,408.65	9,550.60
M-126	Iron and Steel	369	*10,018.86	*5,030.06
L-13-a	Metal Office Furniture	21	804.64	221.34
L-30	Kitchenware	39	1,052.62	437.64
L-62	Metal Household Furnishings	17	972.30	605.01
L-197	Steel Shipping Drums	6	474.45	92.03
	TOTAL STEEL	452	*35,627.08	*24,832.24
M-9-c	Copper	209	2,019.37	1,584.87
M-11-b	Zinc	38	3,208.52	3,048.00
M-38	Lead	0	71.70	62.60
M-43	Tin	0	436.16	429.32
M-65	Cadmium	7	74.61	67.76
M-339	Zinc and Copper Plates	13	19.09	9.62
	TOTAL NON-FERROUS	267	5,829.45	5,202.17

Includes Steel only.

SIMPLE OVERHEAD HANDLING SYSTEM

SAVES $150 in FOUR MONTHS!

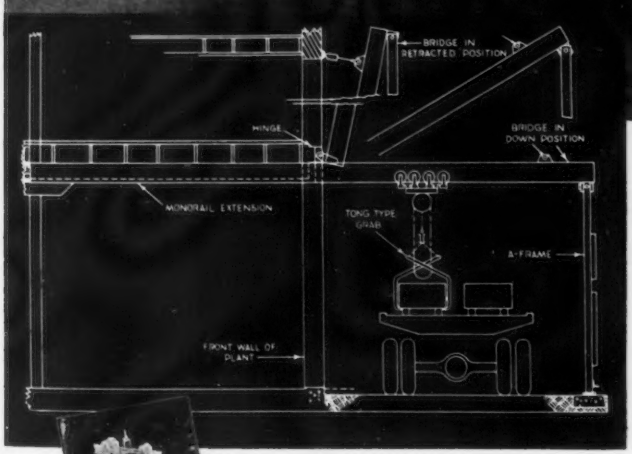


Diagram shows simple system for unloading steel. Crane is retracted against building over door when not in use.

SEND FOR BULLETIN C-1. A 56 page book showing successful applications of American MonoRail Systems

● Steel, formerly unloaded sheet by sheet, is now transferred from trucks to storage in 3-ton bundles. Handling labor was greatly reduced and damage to metal entirely eliminated.

Simple systems like this, worked out by American MonoRail engineers to meet hundreds of operations, speed up production — lower costs — reduce accidents — release skilled hands for more profitable use. Let an American MonoRail engineer show how you can save time and money. Write today!

THE AMERICAN MONORAIL CO.

13103 ATHENS AVE. - CLEVELAND 7, OHIO

hibited product with a view to the quickest reconversion after the war, or whenever greater freedom in the production of civilian goods.

Dr. Holcombe has pointed out that whole communities are largely dependent upon employment in a local industry in some cases, and some months may be required for the management to reconvert. Consequently, he said, wherever needs of war permit the public interest will be better served by a liberal policy.

Individual criteria for granting appeals have been established for most orders as general guidance in making decisions on appeals. This was provided by General Operations Circular No. 165, dated Oct. 7, 1943.

Other members of the Appeals Board are: H. Lillibridge, Office of Civilian Requirements; R. N. Marginot, Labor Production Division; C. Osborn, Office of Operations Vice Chairman; J. W. Sands, Conservation Division.

HE WAS SURPRISED: *Preston Lockwood, president of Brewster Aeronautical Corp, told the Military Affairs subcommittee in Washington that the first time his company learned of the cutback plans was when Henry Kaiser, then president of Brewster, was called to the phone from a board meeting on May 16th.*

WPB Official Says Basic Metals Supply and Demand Now Nearing Balance

Washington

• • • **Supply of and** demand for basic metals for all essential military and civilian programs are more nearly in balance than at any time since Pearl Harbor, S. W. Anderson, WPB Program vice-chairman and Requirements Committee chairman said last week. Mr. Anderson cautioned, however, that in some metal products the balance is precarious, because of manpower losses and expanding military needs for certain specialized items.

"In making third quarter allotments we had to scale down the carbon steel requirements of the various military and civilian claimant agencies by less than 1,000,000 tons," the committee chairman said. "The Military claimants—Army, Navy and Maritime Commission — received virtually 100 per cent of the steel needed, after inventory adjustments, to fulfil their programmed production for the third quarter. It was found necessary, however, to make some reduction in the total requests received from the civilian and export claimants. The situation in flat rolled steel products remains acute.

"The total military demand for carbon steel was down from second quarter requirements by approximately 300,000 tons, due principally to the fact that the merchant ship building program for the coming three months is somewhat below that of previous quarters."

Mr. Anderson said that OCR had been allotted 240,000 tons of carbon steel, as against 217,000 tons for the second quarter.

Mr. Anderson pointed out that a number of these programs called only for the use of off-grade or scrap metal and that the increased allotment does not reflect a change in WPB's present established policy of restricting production of civilian goods to the basic essentials.

Mr. Anderson cautioned that while the supply of steel, copper and aluminum is adequate to meet all programs for the third quarter, mounting manpower shortages represent a potentially serious situation in metals particularly in fabrication and that the same difficulties may be expected in the production of other materials.

Carbon steel supplies to be available during the third quarter are estimated at approximately 14,100,000 tons, representing a drop of nearly 500,000 tons from second quarter supplies. Mr. Anderson said that such a drop follows the usual downward production curve during the hot months and reflects as well the general tight manpower situation in the industry.

THE BULL OF THE WOODS — BY J. R. WILLIAMS

WHAT'S THIS, A SWEDISH MASSAGE OR A BEAUTY PARLOR?
THEY GOT THE OL' BULL O' TH' WOODS SO GROGGY WITH MEDICAL, OPTICAL, AN' DENTAL CLINICS THAT WHEN HE SEES A NEW MACHINE HE THINKS ITS A CHIROPRACTOR'S TABLE!
YOU CAN'T BLAME THE OLD BOYS--'TAIN'T LONG AGO THAT ALL TH' FIRST AID YOU GOT IN A SHOP WAS A BOTTLE OF IODINE AN' A BELT POLE TO HOBBLE HOME ON! OH, THEY HAD A CRUTCH, BUT IT WAS ALWAYS OUT!
KEEPIN' 'EM FIT
6-9
J.R.WILLIAMS
COPR. 1944 BY NEA SERVICE, INC. T. M. REG. U. S. PAT. OFF.

Gagemakers GUARD Against Costly Scrap

and FACILITATE ACCURATE WORKMANSHIP

Visual Gage and precision grinder in a modern gagemaking plant.

Beside each precision grinder in many gagemaking plants, a Sheffield Visual Gage guards against costly scrap loss and helps operators turn out highly accurate work. *The Visual is the most widely used instrument by which gages are checked.* Sheffield appreciates this trust and is vigilantly mindful of the obligation it involves.

Hundreds of production plants also use Visuals at their precision grinders to help reduce scrap and obtain a higher rate of accurate production. *The Visual is recognized throughout industry as the authority on PRECISION.*

DELIVERIES WITHIN TWO WEEKS can now be made on Sheffield Visual Gages of six different amplifications—500, 1000, 2000, 5000, 10,000, and 20,000 to one. WIRE OR WRITE.

ARMY E NAVY

SHEFFIELD MASTER CRAFTSMEN

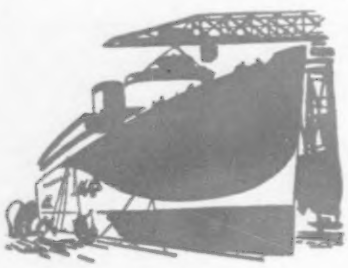
THE SHEFFIELD CORPORATION

Dayton 1, Ohio, U.S.A.

MACHINE TOOLS • GAGES • DIMENSIONAL CONTROL • CONTRACT SERVICES

WEST COAST . . . OSGOOD MURDOCK

• Douglas to lay off 8000, but WMC says California is still 57,760 workers short... Invaluable Pacific Northwest regional analysis folio issued by Bonneville Power Administration.



LOS ANGELES—Between now and September Douglas Aircraft Corp. has announced its intention to lay off approximately 8000 shop and office workers out of the Santa Monica plant. The announcement followed receipt of notice of partial cancellation of contracts on A-20 attack bombers. Recently the third shift was eliminated by the company, and the reduction will affect some 20 per cent of the company's total production personnel at this plant.

In his usual forthright style, Donald Douglas stated that "the company has under negotiation with the government additional contracts for work at the Santa Monica plant. At this time these tentative contracts indicate a gradual build up of our personnel beginning in September and carrying well into 1945. In accordance with established policy first consideration determining the order of lay offs will be given to length of service."

Almost simultaneously at Inglewood, North American Aviation announced termination of B-25 Mitchell bomber production in California on July 8. Hereafter only P-51 *Mustangs* will be made at Inglewod and only B-25 *Mitchells* in Kansas. "Production change has been carefully planned in advance so that as much of the working force as possible can be utilized right through the shop moves" declares J. H. Kindelberger, president, which indicates that some curtailment of the working force may occur.

Consolidated-Vultee at Downey produced its last BT-13 trainer last week. Since the first contract four years ago, 11,537 of these trainers have been produced and spares to constitute 2000 more. This plant is now converting its mechanized assembly line, the first installed in aircraft production, to combat craft projects, wing outer panels, tail sections, wing tips, engine nacelles for B-24 Liberators and wing center sections for P-38 Lightnings.

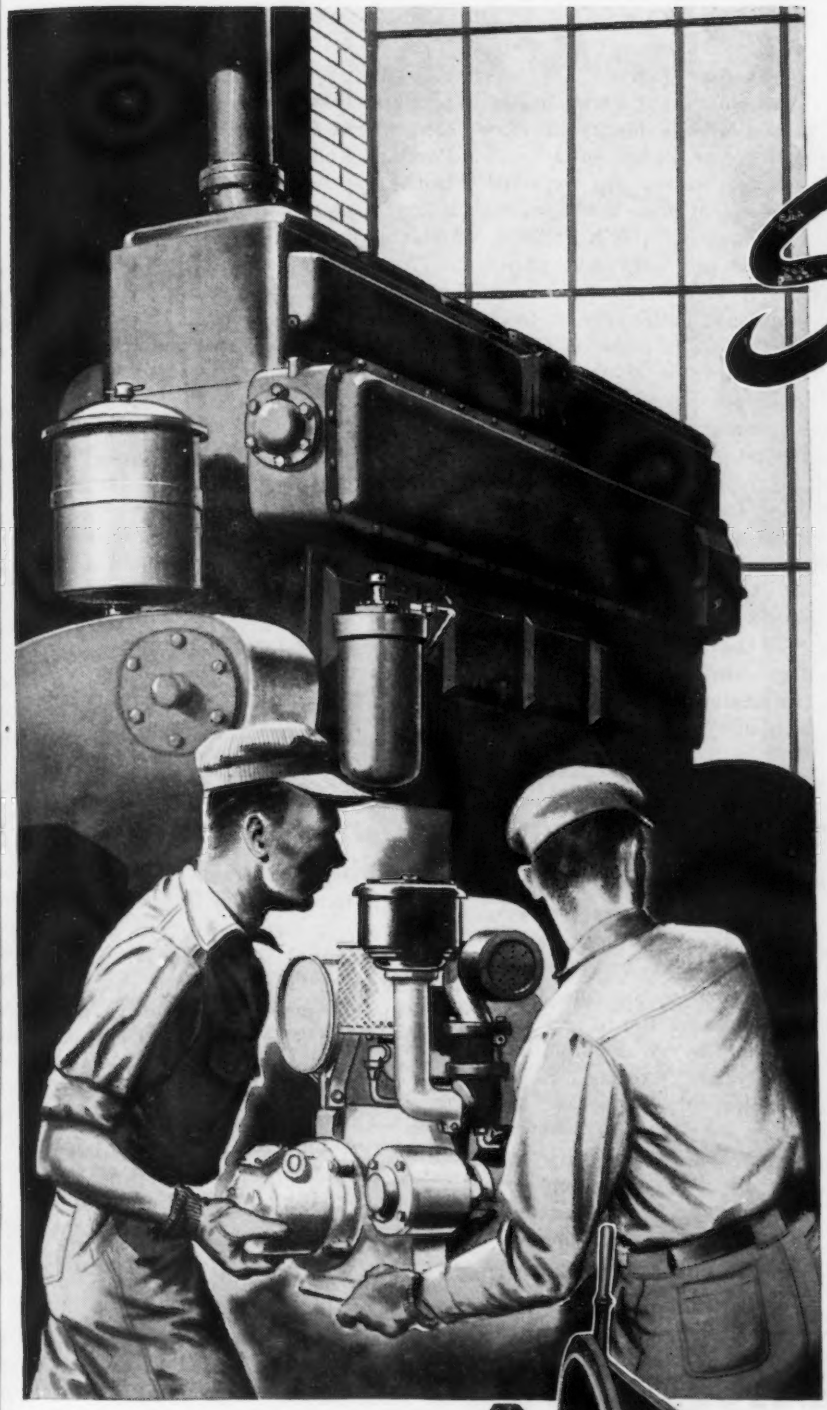
Major aircraft makers are talking more frankly and openly about the postwar future. President Robert E. Gross of Lockheed suggests a great untapped market for a sturdy, serviceable plane retailing for approximately $1000 for private ownership. Consolidated-Vultee casts longing glances at the commercial air transport field for which its B-24 *Liberator* is adaptable.

Relief of pressure on and release of workers by the aircraft industry in Southern California will bring welcome relief to the never ending pursuit of manpower on the West Coast. California's Division of Labor Statistics reported a decrease of 15,900 wage earners in durable goods industries last month, 6200 of them in aircraft plants and 9200 from shipyards. The Navy reports practically no net increase in personnel at its five major West Coast yards. Since the first of the year 9000 have been hired but 9000 have left at Mare Island. Manpower officials with oracular and meticulous accuracy state that 27,494 workers are short in the San Francisco Bay industrial area and 30,266 in Southern California. If there were not marked increases in production per man hour, schedules would suffer worse than they have. So Donald Douglas' 8000 surplus workers, unfortunately dealt from the bottom of his amorphous deck, will be able to locate themselves without difficulty and with considerable opportunity to choose.

PORTLAND — "Pacific Northwest Opportunities" is a 104-page blueprinted, factual, analytical and graphical presentation of the physical, industrial and potential resources of t States of Oregon, Washington, Ida and Western Montana considered a coordinated as an economic unit, they should be.

This newest digest and study the Division of Industrial and R sources Development of the Bonnevi Power Administration is by all oc the most significant contribution th agency has made to promotional li erature. On big pages 15 in. wi by 10½ in. deep are outline maps the region, locating in turn its vari natural resources and industrial d velopments. There are also full pa flow charts and schematic diagram corresponding to organization chart which logically analyze regional deve opments, power and natural resource and, successively, light metals, fe rous metals, non-ferrous metals, no metallics, industrial carbons, indus trial gasses, chemicals, fertilizer plastics, forest industries, agricultura products, domestic and commercia power even to electric housekeepin and air conditioning developments Accompanying text in every ca analyses categorically, industry b industry, activity by activity, the pre ent stage of development in an are larger than France. It further ind cates the limitations of present deve opments and depicts something of th desirable, sound pattern which shou guide future developments. In eac case all steps or missing factors ar indicated.

This survey and analysis has bee under the personal direction of Iva Bloch, the keen, energetic, industria promotion chief of the agency and represents the sort of report whic an enlightened, well-informed, exper ly advised and sound Chamber o Commerce would issue if any Cham ber represented an economic regio rather than a provincial locality. Now that the Bonneville Administratio has developed 1¼ million kw. of elec tric energy, an amount roughly equa to that supplied by the private power companies in its region, it is primarily interested in developing a stronger and better balanced regional economy. Its entire approach is based on the Columbia River and its principal tri utaries, the Willamette, the Snak the Sweetwater, the Salmon an Clark's Fork in Montana. It is sug



Sinews FOR A SYSTEM

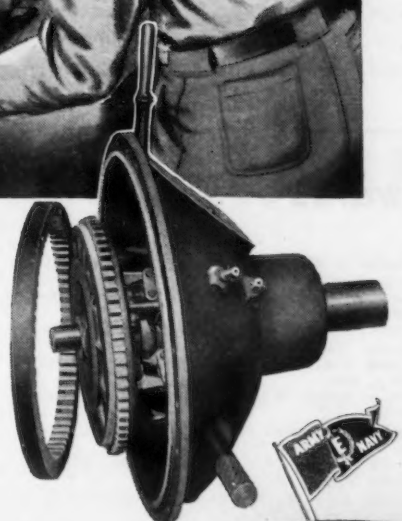
There's a note of challenge in the deep-throated roar of a huge diesel engine—in the staccato bark of a two-cylinder, air cooled gasoline midget. It's a note of defiance inherited from men who build engines to do impossible jobs—jobs far beyond the power of man's muscles.

Internal combustion engines give our system, our way of living, the sinews that help make it great and good. Their development and use have accelerated our progress toward healthier, happier times when all men will live better.

Dependable clutches or power links to connect driving and driven units are vital to the versatility and efficiency of internal combustion engines. The Twin Disc Clutch Company has devoted its more than 26 years of business life exclusively to the design and manufacture of these important connecting links. Inbuilt stamina, reliability and long wear-life have gained for Twin Disc Clutches and Hydraulic Drives the distinction of being chosen as standard equipment on power-driven machines in every conceivable industry.

As a user or builder of equipment involving driving and driven units, you will find it profitable to get in touch with the Twin Disc Clutch Company. Because we are builders of both friction clutches and hydraulic drives, we can offer *complete* answers to power link problems. TWIN DISC CLUTCH COMPANY, Racine, Wisconsin (Hydraulic Division, Rockford, Illinois).

Twin Disc Power Take-offs enable one engine to do many different jobs. Smooth operating, heavy-duty friction clutches, enclosed in housings, deliver full engine torque and horsepower.



gested that these rivers can ultimately produce between 15 and 20 million kw. of hydro-electric energy, approximately one-third the potential power available in the entire United States. Its basic physical development program for early construction includes three dams on Clark's Fork River, three more on the Columbia, seven on the Snake and one on the Willamette which will all produce about 1½ million more kw., to double present energy. The agency believes that these immediately planned developments will provide land and employment for 2,000,000 new population and navigation of the Columbia and its tributary 470 miles inland to Lewiston, Idaho.

Analyzing electric energy consumption in its relationship to rates, the survey points out that in the Pacific Northwest 77 per cent of farms have electric service as compared with the 40 per cent national average. Residential consumption in the area is 1980 kw.-hr. against a national average of 1022 and the rate is 2c. against the national average of 3.67c. In Winnepeg, Canada, where the cost is only 0.8c. per kw.-hr. the per customer domestic consumption has risen to over 5000 kwh. per annum. Population increases on irrigated new lands, it is estimated, will add something over 1,000,000 new consumers by 1960 representing between $50,000,000 and $60,000,000 worth of new distribution equipment and about $175,000,000 worth of electrical appliances spreading out to about $11,000,000 of sales a year.

Industrial power rates in the area are the lowest in the United States; approximately two mills per kwh. at 100 per cent load factor. On this basis it is pointed out that, to the extent that available blocks of surplus secondary or dump power will permit, electric boilers are expected to find a permanent place in the industrial steam plants of the Northwest, particularly in the pulp and paper industry. For a $150,000,000 investment 2860 miles of railroad main lines could be electrified, in addition to the 730 route miles now operated electrically. It is pointed out that operating savings along with 4,000,000 less barrels of fuel oil per year might be expected to retire the cost of such electrification in ten years.

In its data on aluminum, steel and ferro-alloy resources and developments the report states that presently installed in the Pacific Northwest are facilities for the reduction of 315,000 tons of aluminum annually and 18,000 tons of magnesium. Seven open pit electric ferro-alloy furnaces at Wenatchee and Spokane have capacity to produce 35,000 tons of 75 to 85 per cent silicon ferro-silicon annually. At Portland and Tacoma are four additional ferro-chromium and ferro-alloy furnaces with capacity of 28,000 tons annually. Byproduct coke ovens at Tacoma have capacity of 250 tons per day and at Fernie, B. C., 350 tons per day.

It is wisely suggested that the possibility of developing treatment methods to reduce the ash content of Northwest coking coals at minimum costs should be further investigated and a program of research and experiment on the hydrogenation of wester lignitic and sub-bituminous coals should be organized and pursued. Under the iron and steel heading in the analysis of natural resources utilization, a complete and significant analysis of the raw materials and industrial assets and limitations of the region is included.

Subcontract Termination Article Issued

Washington

• • • **A uniform** subcontract termination article in substance the same as for prime contracts has been adopted unanimously by the Joint Contract Termination Board and formally approved by War Mobilizer James F. Byrnes, Acting Board Chairman John M. Hancock announced on June 5.

Subcontractors are to receive the full contract price for all completed articles, but get nothing on the portion of the subcontract on which work has not been begun and no costs incurred. On the portion of the subcontract that has been begun but not completed the subcontractor is entitled to actual costs incurred that are properly allocable to the contract plus an allowance for profit that is not to exceed 6 per cent of the whole of the costs.

Negotiated settlements are encouraged. The profit formula is broken down to provide for a 2 per cent for materials not processed, plus 8 per cent on the remainder of costs, but the agregate not to exceed 6 per cent of the whole of the costs.

Mr. Hancock cautioned that the mere fact this uniform article is inserted in a subcontract does not mean that it is a war subcontract or that it is properly part of a claim against the government. In the settlement of the claims of prime contractors, subcontract claims are treated as an element of cost that must be properly allocable to the prime contract to be recognized by the government.

Also set forth in the statement of policy of the Joint Board which accompanied the release of the termination article, was the fact that procedures will be established by which subcontract claims, many in number but for relatively small sums of money, can be validated automatically provided certain safeguards are observed. This is in line with one of the recommendations for speeding payment to subcontractors in the Baruch-Hancock report of Feb. 15.

. . . Cited for Awards . . .

• • • **The following companies** have won the Army-Navy E award for outstanding war production:

International Steel Co., Evansville, Ind.
Westinghouse Electric & Mfg. Co., Buffalo.
Air Reduction Co., Inc., Ohio Chemical & Mfg. Co., Heidbrink Division, Minneapolis.
Associated Spring Corp., Wallace Barnes Co., Rolling Mill Division, Forestville, Conn.
Bechtel-McCone-Parsons Corp., Birmingham Modification Center, Birmingham.
Coleman Lamp & Stove Co., Wichita, Kan.
E. D. Etnyre, Oregon, Ill.
Ford Motor Co., Ford Glider Plant, Iron Mountain, Mich.
General Motors Corp., Detroit Transmission Division, Detroit.
Goose Lake Box Co., Lakeview, Lake County, Ore.
Hercules Powder Co., Badger Ordnance Works, Baraboo, Wis.
Hubbard Spool Co., Chicago.
Insuline Corp. of America, Long Island City, N. Y.
International Harvester Co., Wisconsin Steel Works, Chicago.
Johnson & Johnson Industrial Tape Corp., New Brunswick, N. J.
Kimberly-Clark Corp., Ordnance Division, Neenah, Wis.
Lofstrand Co., Silver Spring Plant, Silver Spring, Md.
Mathieson Alkali Works, Inc., Saltville Plant, Saltville, Va.
Monarch Engineering Corp., Indianapolis.
Murray Co., Dallas Plant, Dallas, Tex.
Owens-Illinois Can Co., McKees Rocks Plant, McKees Rocks, Pa.
Pittsburgh Coke & Iron Co., Carnegie Carbon Plant, Carnegie, Pa.
Standard Stoker Co., Inc., Erie, Pa.
United States Rubber Co., Bristol Plant, Bristol, R. I., and Stark Mills, Hogansville, Ga.
United Steel Fabricators, Inc., Wooster, Ohio.
Wilmot Castle Co., Rochester, N. Y.

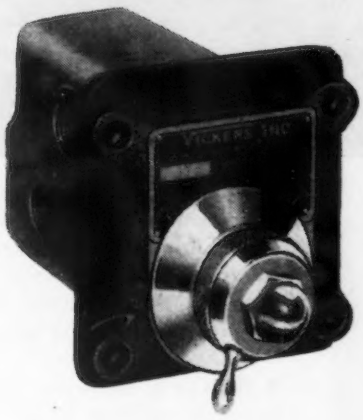
Maritime M

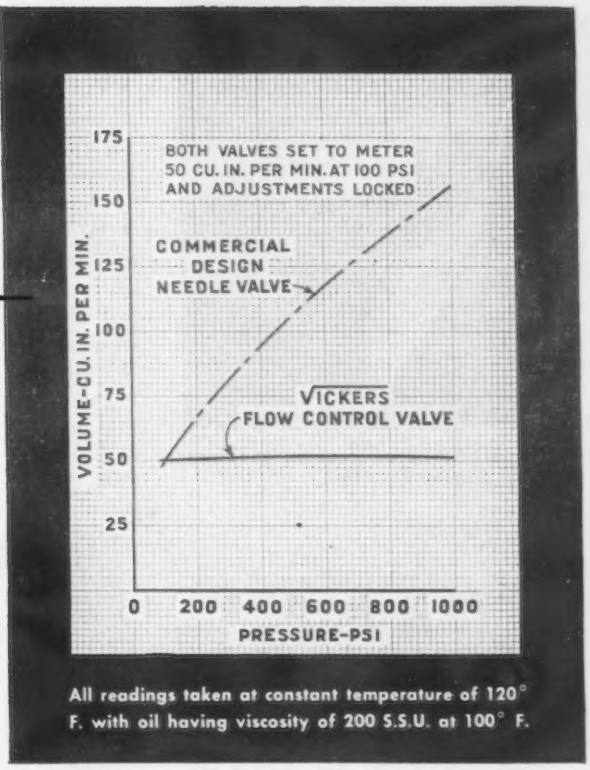
Kaiser Co., Inc., Iron and Steel Division, Los Angeles.
Crocker-Wheeler Electric Mfg. Co., Ampere, N. J.

CONSTANT FLOW RATE

Regardless of

VARIATIONS IN FLUID PRESSURE





All readings taken at constant temperature of 120° F. with oil having viscosity of 200 S.S.U. at 100° F.

As shown by test chart at right, the Vickers Flow Control Valve maintains a practically constant metering rate (for a given setting of the control adjustment) regardless of variation in fluid pressure. This ability to accurately control the rate of travel of tool head or slide . . . or the rpm of a hydraulically driven work spindle . . . at all times regardless of the resistance encountered is a fundamental requirement of many types of machine tools and special machinery. The absence of a hesitation, jump or a speed variation with a load change is important because these nearly always are detrimental to tool life, work finish or proper operation. Tool damage when "breaking through" work is eliminated and variations in cut or operating pressure have no appreciable effect upon feed rate. See Bulletin 40-15 for complete information.

Vickers Application Engineers will gladly discuss with you how "hydraulics" can be used to your advantage.

VICKERS *Incorporated*

1420 OAKMAN BLVD. • DETROIT 32, MICHIGAN

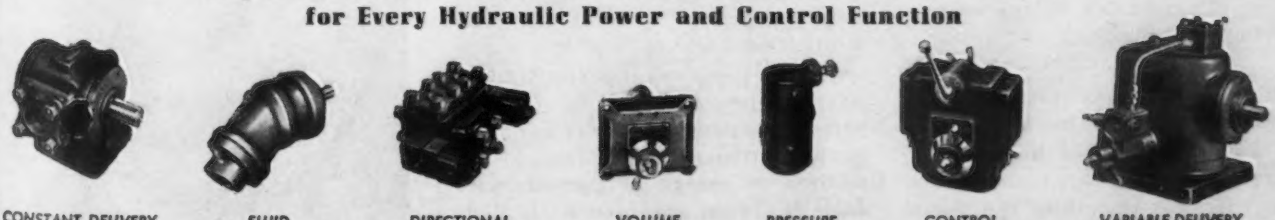
Application Engineering Offices: CHICAGO • CLEVELAND • DETROIT • LOS ANGELES
NEWARK • PHILADELPHIA • ROCHESTER • ROCKFORD • TULSA • WORCESTER

VICKERS

Adjustable

FLOW CONTROL VALVES

Representative of More than 5,000 Standardized Vickers Units for Every Hydraulic Power and Control Function



CONSTANT DELIVERY PUMPS | FLUID MOTORS | DIRECTIONAL CONTROLS | VOLUME CONTROLS | PRESSURE CONTROLS | CONTROL ASSEMBLIES | VARIABLE DELIVERY PUMPS

PERSONALS

M. D. BENSLEY, general manager, H. K. Porter Co., Inc.

• **M. D. Bensley** has been appointed general manager of the three plants of H. K. Porter Co., Inc., Pittsburgh, at Mt. Vernon, Ill. The plants, which recently became Porter subsidiaries, are Mt. Vernon Car Mfg. Co., Wheel Foundry Division of Mt. Vernon Car, and J. P. Devine Mfg. Co.

• **L. F. McGlincy**, has been made manager of operations of the Pittsburgh district, American Steel & Wire Co., succeeding **E. H. Broden**, who has retired after almost half a century of service with the company. Mr. McGlincy was general superintendent of the Donora, Pa., Steel & Wire Works. He has a 20 years' service record with the company.

• **Dr. L. H. Fuller** has been appointed assistant chief engineer, the Joshua Hendy Iron Works, Sunnyvale, Cal. Dr. Fuller, former head of the school of electrical engineering at the University of California, has served as consulting engineer to Hendy during the past 16 months.

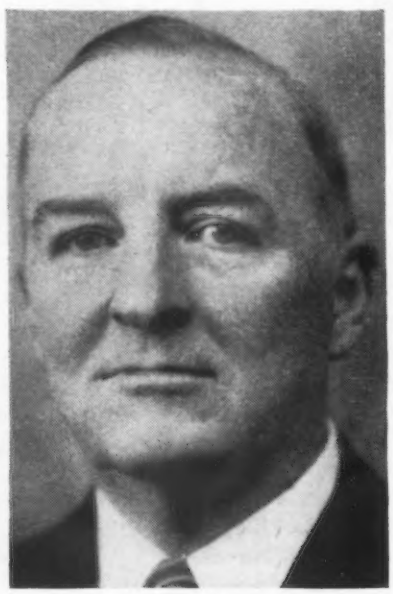
• **Gordon J. Bell** has been elected vice-president in charge of production, and **Joseph F. Bode**, vice-president in charge of purchasing, Briggs & Stratton Corp., Milwaukee.

• **W. F. Boyle**, has been appointed manager of gas turbine activities at the Steam Division of the Westinghouse Electric & Mfg. Co., Philadelphia. He has been with the Steam Division and the Middle Atlantic sales district of Westinghouse since 1927.

o o o

• **C. B. Pooler** has been appointed vice-president in charge of manufacturing, Philip Carey Mfg. Co., Cincinnati.

• **Edward L. Miller** has been made manager of engineering, in charge of design engineering and the research departments, American Machine & Metals, Inc., East Moline, Ill. He succeeds **C. W. Anderson** recently promoted to vice-president and general manager of the company's new subsidiary, U. S. Gauge Co., Sellersville, Pa.



FRANK K. METZGER, vice-president in charge of sales, Baldwin Locomotive Works.

• **Frank K. Metzger** has been elected vice-president in charge of sales of the Baldwin Locomotive Works, Eddystone, Pa. Mr. Metzger first became associated with Baldwin in 1909 when he was employed by the Standard Steel Works Co., a wholly owned subsidiary. In 1930 he became vice-president and general manager in charge of operations and sales of the Standard Steel Works and shortly after this company became a division of the parent company, Mr. Metzger was elected divisional vice-president of Baldwin in charge of that division. **John D. Tyson** has been made divisional vice-president in charge of the Standard Steel Works Division.

• **L. C. Welch**, assistant general manager of sales in charge of the lubricating and sales technical service departments of Standard Oil Co. of Indiana, has been elected a member of the board of directors.

• **Clarence W. Pearson** has been appointed plant superintendent of Rodgers Hydraulic, Inc., Minneapolis.

• **O. R. Reller**, formerly production manager, has been elected vice-president, Moline Tool Co., Moline, Ill.; **W. C. Rosborough**, treasurer and assistant general manager, has been elected a director of the company. **C. E. Parkhurst** has been appointed chief engineer, succeeding **A. E. Lindberg** who has retired; and **D. C. Eipper** has become assistant chief engineer.

• **William L. Walsh**, has been appointed district sales manager of the New York and New Jersey territory, for the Stanley Works, Steel Division, Bridgeport, Conn. He succeeds **Thomas J. Connors** who has resigned.

• **Clinton E. Swift** has been appointed assistant manager of the Engineering and Research Department of Eutectic Welding Alloys Co., New York. Before joining Eutectic, Mr. Swift was the manager of the welding division of Ampco Metal, Inc.; prior to that he had been on the engineering staffs of C. F. Braun Co. of Cal., American Brass Co. and Westinghouse Electric & Mfg. Co., East Pittsburgh.

CLINTON E. SWIFT, assistant manager of the Engineering and Research Department, Eutectic Welding Alloys Co.

WILLIAM F. LAMOREAUX, research metallurgist, Cooper-Bessemer Corp.

• **William F. Lamoreaux** has been made research metallurgist at the Cooper-Bessemer Corp., Mt. Vernon, Ohio. Mr. Lamoreaux, who for the past three years was director of research for the Meehanite Metal Corp., will divide his time between the company's two manufacturing works.

• **J. Maynard Peterson** has been appointed controller for the Buffalo and Kenmore plants of Curtiss-Wright Corp. Airplane Division. He formerly was assistant treasurer of Western Cartridge Co., East Alton, Ill., and treasurer of U. S. Cartridge Co., St. Louis.

• **William W. Smith** and **Ray Harrison** have been elected directors of the A. M. Byers Co., Pittsburgh. Mr. Smith is a senior member of the law firm of Smith, Buchanan & Ingersoll. Mr. Harrison is a vice-president of the Mellon National Bank.

• **Wm. F. Burditt, Sr.** has been elected president, **Paul Doxey**, formerly works manager at Turbo Engineering Co., in Trenton, has been named works manager, and **Ernest Carlson**, formerly chief of machine design at Allen Engineering Co. has been made chief process engineer of the Service Machine Co., Elizabeth, N. J.

• **William G. Hancock**, general sales manager of McCord Radiator & Mfg. Co., has been elected to the board of directors of the Automotive Council for War Production.

• **Clarence Frazier**, vice-president, has been appointed manager of the Peerless Pump Division of the Food Machinery Corp., Los Angeles. Mr. Frazier suceeds the late Vernon Edler.

• **A. E. Rhoads** has been elected executive vice-president and general manager of the Kuhlman Electric Co., Bay City, Mich. Since 1938 Mr. Rhoads has been manager of the Detroit Electric Furnace Division of Kuhlman.

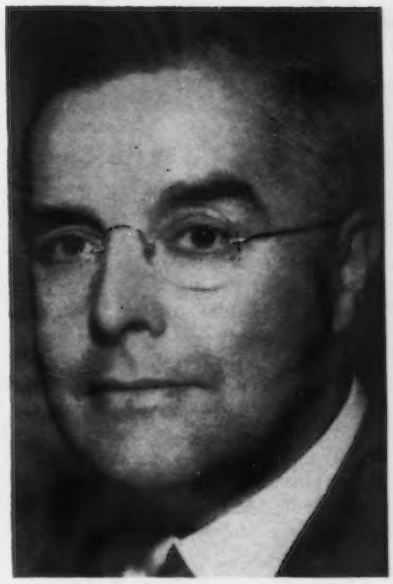
• **Dr. Lawrence W. Bass** has become associate director of research of the Air Reduction Co., Inc., and the U. S. Industrial Chemicals Co., Inc., New York. Formerly director of the New England Industrial Research Foundation, he will continue his association with that organization in the capacity of technical consultant.

• **George C. Frank**, formerly chief clerk to the president, has been made assistant to the president, Erie Railroad Co., Cleveland. Mr. Frank succeeds **C. E. Coe** who has resigned.

• **Clifford T. Appleton** has been appointed manager of the Machine Division of Rolled Thread Die Co., Worcester. He will be in charge of development and sales of the new Reed cylindrical die thread roller.

• **Walter A. Funck** has been made general superintendent, the Reliance Foundry Co., Cincinnati. He succeeds **George Freiberger** who has retired.

• **R. C. Geekie** has been appointed assistant to the president in charge of sales, Scullin Steel Co., St. Louis.



J. B. MACNEILL, manager of the Switchgear and Control Division, Westinghouse Electric & Mfg. Co.

• **J. B. MacNeill** has been made manager of the Switchgear and Control Division of the Westinghouse Electric & Mfg. Co. He succeeds R. A. Neal, whose election as a vice-president was recently announced. Mr. MacNeill, who has been associated with Westinghouse since 1909, has been successively engineer, section engineer, manager of the circuit breaker engineering department, general manager of distribution engineering and manager of switchgear engineering.

• **Henry L. Metz** has been appointed manager of the department of education, Addressograph-Multigraph Corp., Cleveland. He will work with the company's field organization.

OBITUARY...

• **Louis M. Rossi**, vice-president of Bakelite Corp., unit of Union Carbide & Carbon Corp., died May 25, following a sudden illness. Mr. Rossi had been vice-president and director of manufacturing since 1923.

• **John Reis**, vice-president of the U. S. Steel Corp. at his retirement in 1926, died May 26, at the age of 84. Mr. Reis devoted his entire business career of 45 years to the iron and steel trade. He had been with U. S. Steel since its inception in 1901.

• **Harrison F. Lyman**, president and director of the Massachusetts Gear & Tool Co., Woburn, Mass., died May 22.

• **John B. Chalmers**, director of training schools and safety engineer of the Yale & Towne Mfg. Co., Stamford Division, died on May 23. He was 61 years old.

• **Lewis A. VanSice**, 58, general superintendent and a director of Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y., died May 24.

• **Philo M. Gelatt**, prominent industrialist of La Crosse, Wis., and founder of the National Gauge & Equipment Co., later taken over by the Electric Auto-Lite Co. died May 20.

• **Norman L. Myers**, eastern district manager of the Electrical Appliance Division, Westinghouse Electric & Manufacturing Co., died recently. He was 49 years old.

Fatigue Cracks . . .

BY A. H. DIX

P.M. Mends a Weak Spot

• • • We see by the papers that Winston Churchill has directed his staff to avoid using "breakdown" as a synonym for "analysis." If the P.M. doesn't mind we will include ourselves in on the injunction, as we have long feared that skimmers, who read or hear only every sixth or seventh word, may mistakenly choose the dismal alternate meaning of "breakdown."

If we said, for example, that a breakdown of your favorite family journal's circulation reveals that the average Dun-Bradstreet rating of subscribers exceeds a third of a million, the hasty reader might jump from "breakdown" to "circulation" and from there to the conclusion that the family is going to pot. As a matter of fact, the exact opposite is the truth; the family is growing like corn during a hot spell.

Late Echo on Cut Nails

• • • May I insert a belated oar into the cut nail discussion? I am only 49 but when I lived in Cradley Heath district in 1904 every working class house had a small hearth in a backyard outhouse and the whole family made nails at a wickedly low price.

They got their steel in bundles from a middleman who also bought their nails and who usually had a scale that weighed heavy in selling and light in buying. Finally things got to such a pitch that there was a series of devastating strikes and the whole handmade nail trade vanished in a few years—wiped out by the machines imported to fill the gap.

In 1941 there was only one nailer left, a man of about 60. He made the nails used by skiers, and I believe he is dead now or gone into munitions.

—*"Limey,"*
Woodside, Oakley Green, Windsor

Scissored Bouquet

• • • Will the member of the brains department who is now with the Seabees in the South Pacific, hereafter please write on only one side of the sheet. His last letter, written from some point near the equator, begins:

> Even aboard this ..... The Iron Age is well known.

The dots indicate a hiatus created by the censor's scalpel. On the other side of the sheet the hole occurs in the middle of *"Each one of us would give a .....'s pay for a tub of fresh water to lie in for a while."* As the censor could hardly object to the dollar evaluation of a bath, the first sentence is undoubtedly the guilty one. Our guess is that it read, "Even aboard this *ship the admirable* THE IRON AGE is well known."

Navy policy forbids praise of competitive products.

Low Tolerance

• • • Uncensored is this paragraph:

> The local island paper has some news of a new strike at the Ford plants. Too bad those men cannot know the comments of the boys—most of whom are ex-union men. When you've stood a submarine watch all afternoon in the hot sun, or have seen the definite consequences of a lack of certain equipment, your appreciation of the fine points involved in labor disputes, particularly the jurisdictional kind, is likely to vanish.

Poker, Prayers, Craps

• • • Nor did the censor scissor this:

> A sense of humor is of inestimable value here. Last night there was a poker game on No. 8 hatch, a prayer meeting on No. 7, gun loading practice on the island deck, and a crap game on No. 6 hatch. We have a jazz band that plays but three numbers, and all of them badly. The chaplain handling the public address system is one of those unfortunate lads who thinks he has a sense of humor, but definitely has not.

All's Well That . . .

• • • The capstone of our cognominal column used to be WAC chief Oveta Culp Hobby. Then we switched to the Children Fund of Michigan's Dr. Icie Macy Hoobler. Now will Dr. Hoobler please step down and make room for a gentleman whose name we spotted in last week's *Life's* "Letters" page, D. R. Overall-Hatswell.

Word Miser

• • • When rebuked for miscalling Philadelphia's Union League the "Union League Club," we not only apologized but complimented the Philadelphia organization on avoiding the pit of redundancy into which the Union League Clubs of New York, Chicago and San Francisco have fallen. For a *club* is a *league* and either word is enough.

But Charles H. (Service Station Equipment Co., Ltd., Toronto) Ward would go further. "Inasmuch as a union is a league," he writes, "why not simply 'The Union'?" The point is sound and we pass it along for the consideration of Union Leagues, Union League Clubs, and the Union League Club Associations, existing and still unborn.

One Step Enough

• • • Inmate of the next cell, Technical Editor Frank J. Oliver, thinks that dropping the "Club" is enough for the time being. He noticed when walking down Park Avenue the other day that the New York organization has "Union League Club" engraved on its cornerstone, and puttying up more than one word would leave the inscription badly out of balance.

No Reducing Diet

• • • This tribute to brevity in writing appears in Quentin Reynolds' book, "The Curtain Rises":

> There are only 297 words in the Ten Commandments. That is great reporting.

Reynolds is guilty of inexactness. Moses was not a reporter. He created and carved out a code. The Decalogue is a model of compactness but can hardly be offered as an example of persuasive writing, considering how industriously its injunctions are violated.

We see no great virtue in brevity, nor any overwhelming demand for it. The notably successful newspapers, books and magazines are those that give the reader a full measure of information, and as an example of each we offer the *New York Times*, Konrad Heiden's "Der Fuehrer," and your favorite family journal.

People and publications that measure their verbiage in troy weight too often do so because of the inadequacy of their information. If the brains department ever gives you short measure on a new development you should know about, it won't be because an appeting sirloin was deliberately reduced to beef extract. It will be because that's all we have been able to dig up so far.

Puzzles

Last week's wires intersect at a height of 24 ft.

We worked a half hour on this one shown us by Bill Hoffman, of field staff, and then concluded it couldn't be done. In five seconds he demonstrated that it could be.

Lay 10 matches in a row like this: I I I I I I I I I I. Try to convert them into 5 X's— X X X X X—by lifting a match and jumping over two matches. For example, your first move might be picking up Match No. 1, jumping No. 2 and No. 3, and placing No. 1 crisscross over No. 4 to form an X. When you jump an X it counts as two matches.

If you can solve it, without regard for a time limit, you are very bright.

"FAIRBANKS-MORSE SCALES—ARBITERS OF BUSINESS"

What's YOUR Decision!

"Safe!" says the umpire. And his decision is final. It should be. Making fast, accurate decisions is his business.

As umpires of weighing in business and industry, Fairbanks-Morse Scales have been rendering accurate decisions since 1830—when the first Fairbanks-Morse Scale was built. They have exerted a powerful influence on the progress of industries and the welfare of nations.

Today—Fairbanks-Morse Scales are used, not merely because of their extreme accuracy, but also because of their ability to increase production by their automatic control of materials in processing. Write to Fairbanks, Morse & Co., Fairbanks-Morse Building, Chicago 5, Illinois.

BUY WAR BONDS

FAIRBANKS-MORSE

DIESEL ENGINES
PUMPS
MOTORS
GENERATORS
WATER SYSTEMS
SCALES
STOKERS
FARM EQUIPMENT
RAILROAD EQUIPMENT

Scales

Dear Editor:

SOLDIERS AND UNIONS

Sir:

I understand you recently made a poll of the attitude of soldiers toward unions. I would appreciate it if you could send me a copy of the results.

DON ROBINSON,
Editor
American Press,
225 West 39th St.,
New York

● For the results of our survey, see page 87, May 25 issue.—Ed.

Sir:

I would be very glad to have a copy of the report on the survey you have made on the reemployment attitudes of returning service men, as reported in the May 24 New York *Times*.

HAL W. HAZELRIGG,
Director of Public Relations
American Home Products Corp.,
350 Fifth Ave.,
New York

● For the results of our survey, see page 87, May 25 issue.—Ed.

RECIPROCATING DRILL

Sir:

I would appreciate any information you have concerning the new method of drilling steel which involves vibrating the drill to break up chips and speed up the operation.

ERLE I. SHOBERT II,
Engineering Department
Stackpole Carbon Co.,
St. Marys, Penna.

● See page 48, June 17, 1943, Iron Age, for a description of an attachment that causes the drill to reciprocate rapidly.—Ed.

PLEASE STATE BUSINESS

Sir:

We wish to thank you for the many inquiries we receive from you for copies of our technical literature. These inquiries, of course, result from mention made in THE IRON AGE.

Would it be asking too much for you to request your readers to indicate the nature of their business? You are undoubtedly aware that company names frequently have failed to reveal such information, but it would be extremely helpful to us if this could be provided.

C. R. MAXON,
Market Development Division
New Jersey Zinc Co.,
160 Front St.,
New York 7

SCRAP MONEL

Sir:

Who are the country's largest consumers of scrap Monel?

PHILIP G. SMITH
Philip G. Smith Co.,
Outer Drive and Pennsylvania R.R.,
Detroit

● Practically all of it is sold to scrap dealers who in turn are governed by order M-6-B as amended May 16, 1944. For uses permitting Monel a rating AA5 or better is usually required. Scrap dealers handling Monel send the bulk of their scrap currently to steel mills, which utilize the scrap in the production of low alloy high tensile steel. Second largest use of Monel scrap is through major remelters, who prepare 50-50 shot for sale to the non-ferrous foundries.—Ed.

HEAT SENSITIVE PAINT

Sir:

We are in need of temperature sensitive paints which are used in determining the temperatures to which iron parts have been heated, by the change in color on the paints.

MARK KINDT,
Secretary
Dynamatic Corporation,
3307 Fourteenth Avenue,
Kenosha, Wis.

● Crayons and pellets that melt at predetermined temperatures, from 200 deg. F. to 1600 deg. F., are made by the Tempil Corporation, 132 W. 22nd St., New York. We understand that a temperature-sensitive paint has been developed in Germany, but as far as we know, it is not made here, and little information is available about it.—Ed.

UNPICKLED STRIP

Sir:

Is there equipment made for cold-reducing steel strip directly after annealing and deoxidizing and without intermediate pickling?

RICHARD G. AUSPITZER
90 West Broadway,
New York 7

● See the description of the Sendzimir mill, July 23, 1942, Iron Age.—Ed.

NICKEL CATALYST

Sir:

Where can we get the Raney Nickel Catalyst?

HAROLD H. BLOCK,
Metallurgist
AiResearch Manufacturing Company,
9851-9951 Sepulveda Boulevard,
Los Angeles 43

● From the Central Scientific Co., 1700 W. Irving Park, Chicago.—Ed.

SURFACE PROTECTION

Sir:

The article, "Surface Protection of Aircraft Parts," in the May 18 issue, is of considerable interest to our Engineering Department, as it contains solutions of problems which have been bothering us for a long time in the manufacture of our aircraft instruments.

Could you send us three reprints?

HAROLD J. LEMKIN,
Purchasing Agent
DeJur Amsco Corporation,
Shelton, Conn.

AMS STEELS

Sir:

I am endeavoring to discover if there exists a decoding chart for A.M.S. steel specifications. We have the Standard Steel Chart from your May 6, 1943 issue, showing the NE equivalents but cannot find anywhere a comparison chart of S.A.E. and A.M.S. equivalents.

There is a list of A.M.S. steel specifications but there seems to be no available chart on decoding the number.

ROBERT F. EBBERT,
General Stores Department
Jacobs Aircraft Engine Company,
Pottstown, Penna.

● The Iron Age NE-Standard Steel Chart shows the AMS (Aeronautical Material Specifications) equivalents of AISI, SAE, AN-Aero, and NE, in cases where comparability exists. Data on the specifications to which each AMS number applies may be obtained from the National Advisory Committee for Aeronautics, 1500 New Hampshire Avenue, Dupont Circle, Washington 25.—Ed.

SAE-AISI DIFFERENTIALS

Sir:

We notice you publish from time to time quite a complete list of alloy differentials for NE steels, but we have not located any such complete list for S.A.E. and A.I.S.I. series.

Can you tell us where we can get an up-to-date list for these series?

A. R. HUBBARD,
Secretary
Atlas Steels Limited,
Welland, Canada

● A complete listing of these differentials would occupy about ten pages and it would be impracticable to publish such a volume of prices each week. However, they can be obtained from almost any steel company.—Ed.

SONIC TESTING

Sir:

In your January 6, 1944 issue of IRON AGE, page 63, mention is made of testing castings or forgings by hitting them with a hammer and the sound being picked up by a microphone and amplified.

I am desirous of obtaining additional information.

J. D. MATTIMORE,
Director of Research & Development
Tube Turns, Inc.,
224 East Broadway,
Louisville, Ky.

● We have no data other than what appeared in the Jan. 6 issue. The development is still in an experimental stage and most of the information has come to this country from England and Germany. As far as we know, no new data are obtainable and no equipment is available in this country.—Ed.

FLASH TRIMMER

Sir:

Do you know of anyone manufacturing a rotary flash trimmer similar to that made some years ago by the Vulcan Engineering Corp., of Jackson, Michigan?

R. E. RISLEY,
Manager of Engineering
Dresser Manufacturing Company,
Bradford, Penna.

● Crankshaft Machine Co., Jackson, Mich.—Ed.

T&W FORGINGS

usually cost less at the point of assembly

● It is possible through forging design to reduce dead weight, because forging produces maximum strength and toughness in lighter sectional thicknesses. The possibilities of forgings should be thoroughly understood before undertaking to design the part. What appears to one engineer as complex and difficult may be, because of experience, comparatively simple to another forging engineer. Therefore, there are no fixed limitations on forging designs. When you begin to design a part to be forged, ask a T & W Engineer to show you the wide range of shapes and sizes that can be produced by forging. He will guide you in avoiding many limitations. The primary objective of a T & W Forging Engineer is to assist you in developing forging designs that will make the parts cost less at the point of assembly.

In forging this Howitzer part of unusual design, the problem is to get proper concentration of fibre flow lines at point of greatest shock and stress.

TRANSUE & WILLIAMS

STEEL FORGING CORPORATION • ALLIANCE, O.

SALES OFFICES: NEW YORK, PHILADELPHIA, CHICAGO, INDIANAPOLIS, DETROIT AND CLEVELAND

This Industrial Week . . .

- **Invasion Increases Steel Production Tempo to New Peak**
- **New Fronts Seen Having Sobering Effect on Work Stoppages**
- **WPB Tells Steel Companies to Review CMP Rules and Regulations**

THE start of the long expected invasion of Western Europe this week is expected to increase the pressure for early deliveries of strategic steel to a tempo not seen since the war began. The psychological effect of the actual beginning of the new fronts will probably be strong enough to furnish impetus to surmount, to some extent, production difficulties caused by manpower shortages, strikes, equipment wear, and bad product mix.

However, the invasion has come at a time when the steel industry is in its best position production-wise and capacity-wise to insure the most rapid output possible of ship steel, shell steel, and all other types needed to support the new as well as old battle theaters.

It may be that some time will be needed before clarification is forthcoming as to the magnitude of the Allied success. When that period is up it seems certain that even more concrete plans will be made to adequately support what is expected to be a long, hard grind, with equipment and war material produced on a scale not before seen.

The steel industry this week is on the verge of entering a period which will see an unusual output of shell steel, increases in lend-lease steel shipments, jammed up schedules on wide strip and plate mills to take care of ship plates, car plates, sheets for shell containers and other packaging, more tubes for increased bomb programs, and a host of other needs which will be needed to support the new fronts in Europe. That there will be no let-up in the effort to see that all these items get the right of way is a foregone conclusion and any talk of civilian needs being filled to any extent will have disappeared, if any had been in the picture.

THE unusual number of "quickie" or outlaw strikes which have spread to various parts of the steel and allied industries may subside now that it is clear that even a small strike may tie up the urgent material needed for the second front.

Whether labor leaders have become statesmen enough to save their unions from a reaction on the part of the public because of outlaw strikes remains to be seen. Action by some has been beneficial. If the increased war tempo, with its grave overtones, is enough to quiet down the jitteriness of the rank and file workers, it may be that the number of unauthorized strikes will diminish.

Such a move would have a stimulating effect on production because it would remove one of the chief difficulties of management. The latter has been hard pressed to keep up schedules of various war products to a desired level when periodic stoppages occur that cut down regular production. But more important is the fact that they have prevented the attaining of that small excess which results when everything is clicking smoothly.

THAT the steel industry will have its hands full in producing the required amount of war steel in the third and fourth quarters was evidenced this week by reports of an additional shell container program which may take as much as 150,000 tons of steel in the fourth quarter and first quarter of 1945. Further indications of a tighter delivery period with pushbacks on essential civilian orders are such items as the effort of the WPB to find a home for more than 150,000 tons of plates in the third quarter. If the usual method is used to place this plate tonnage with steel producers it will be in the form of over-allotments.

The WPB Steel Division, in an effort to prevent too serious jams in deliveries as well as to alleviate, wherever possible, the distribution effects of an unbalanced product mix, recently sent letters to steel producers urging them to acquaint their sales staffs fully with CMP and its value for orderly steel distribution. In some circles this letter was being interpreted as a quiet reminder that full compliance with CMP will be closely watched by the WPB in the third and fourth quarters.

Diagnosis of the situation in some steel centers appears to lend further strength to the belief that the only sure cure for the current steel distribution problem would be a rapid success in the invasion of Western Europe engendering drastic cutbacks in currently plotted programs.

REPORTS from some centers this past week indicated a continuation in the reduction in the volume of steel order cancellations. In some instances, the cancellations are running as much as 75 per cent below those encountered in the first quarter. Coincident with this situation has been a fairly steady flow of new bookings. While orders are off slightly in some areas during the past week, declines were not significant. The manpower pinch is being felt at some steel company plants to an extent which tends to cut into production. Consequently, the combination of a stable order flow and such factors as manpower shortage have tended to keep steel backlogs substantially unchanged.

National steel ingot production this week continues at 97 per cent of capacity. Offsetting the loss of one point at Pittsburgh to 94 per cent was the gain of a point at Chicago to 101.5 per cent. Other gains are noted this week in Buffalo, up two to 106.5; Birmingham, up two to 99; and St. Louis, up 25 to 99. Philadelphia output declined two points to 97.5 per cent while the Western District has fallen five and a half points to 86.5 per cent. Down 16½ points to 83 per cent are Eastern District operations. Continuing unchanged are Youngstown at 95; Cleveland at 98.5; Detroit at 101; and Cincinnati at 92.

• **NAILS**—While small nails have been tight for some time due to their use in war packaging, etc., recent demand has brought larger sized nails close to the extended delivery stage. Jobbers are said to have plenty of stocks but this condition may not be the same in the next few months. Recent rush demand for the larger sized nails has come from the Army and lend-lease.

• **BARBED WIRE**—Heavy purchases of barbed wire recently by the War Department has speeded up this market. Some makers will have quite a run getting out the new business and where a year ago deliveries were easy and stocks not out of balance this condition does not prevail now. Several months ago the Army turned back some barbed wire into the farm trade.

• **BOMBS AND BOMBS**—The bomb program is in for quite an expansion in the third quarter and reports are that the fourth quarter will see even more requirements than in the third. Needs for the third quarter will be about twice as great as first or second quarter orders. Fourth quarter outlook seems to indicate that bomb tubing will be in such demand that oil country goods output may be curtailed. While oil country goods requirements are said to be nothing unusual for the third quarter, a heavy drain of orders is looked for in the last quarter of the year. Tubes for bombs coming off the seamless mills will be all sizes with no one size outstanding.

• **BIG STEAL**—Conceived during World War I, Holland's steel industry was killed off in World War II. The obituary was in the form of a German statement that the blast furnaces and rolling mill in the town of Velzen on the North Sea canal which links Amsterdam with the sea had been dismantled and carried off to Germany. The haul included 5000 electric motors, 5000 rollers, miles of cable and four traveling cranes, all of which were "acquired" by the Hermann Goering works. The Germans explained this transfer as a "protective measure against destruction by the invading allied armies."

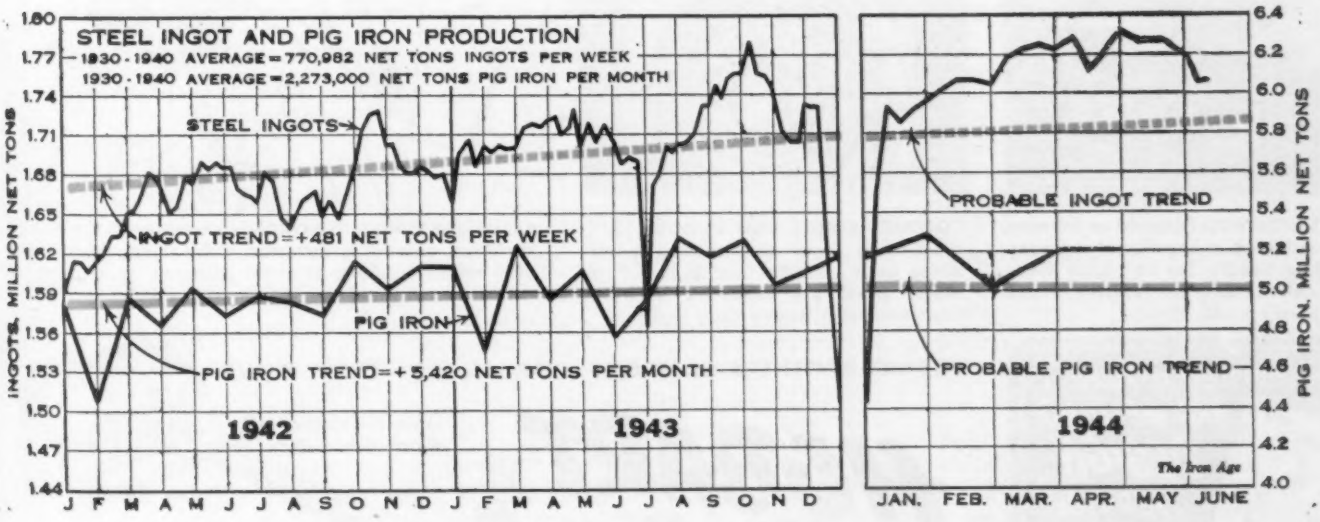
• **CONCRETE BARS**—May sales of concrete bars, east of the Rocky Mountains, will probably run around 40,000 to 45,000 tons. Sales in April were about 29,000 tons but March bookings ran to 46,000 tons. These tonnages are in contrast to February and March of last year when sales were about 14,000 tons. One reason concrete bar business is more brisk is because of more leniency on the part of WPB in approving construction. Also conservation restrictions have, for the most part, been removed as far as concrete bars are concerned. It will be some time though before monthly tonnages will approach those of a few years ago when 75,000 tons of booking was a low month.

• **NO STRIKE**—Detroit had its first day in months recently that no industrial strike was in progress. But the next day saw workers at Continental Motors Corp. walk out after a fight between workers and supervisors; and 40 strikers in the iron melting department of the Ford Lincoln plant forced shutdown of departments employing 600, due to lack of materials. Unofficial figures showed that 4,106,740 man-hours were lost in the Detroit area during May because of strikes.

• **PLATES STRONG**—Steel plate demand is still strong and is expected to remain that way for the balance of the year. Some sources look for a pickup in Maritime plate orders in the fourth quarter. Plate estimates have been changed so much in the past year that it would not be unlikely for third quarter plate needs to be heavier than is now contemplated. At the same time is is hard to match the heavy plate requirements up against reports that merchant shipbuilding is to slide off later this year.

•**LAY-OFFS**—Douglas Aircraft Corp. at Santa Monica, Cal. is expected to lay off 8000 workers within the next four months, following the cancellation of the Army contract for A-20 Havoc Bombers. The cancellation notice came May 31 from the Air Forces Materiel Command. This follows closely on the heels of the cancellation of the Navy contract at Brewster, which resulted in a stay-in strike and the cancellation of a sizable Army aircraft contract at Bell Aircraft in Buffalo.

The Iron Age



Steel Ingot Production by Districts and Per Cent of Capacity

Week of	Pittsburgh	Chicago	Youngstown	Philadelphia	Cleveland	Buffalo	Wheeling	South	Detroit	West	Ohio River	St. Louis	East	Aggregate
June 1	95.0	100.5	95.0*	99.5	93.5	104.5	98.0	97.0	101.0	92.0	92.0	74.0	106.5	97.0*
June 8	94.0	101.5	95.0	97.5	98.5	106.5	98.0	99.0	101.0	86.5	92.0	99.0	83.0	97.0

* Revised

Hobarts *have* Exceptional Arc Stability

Throughout Their Wide Welding Range

Inherent Reactance *Assures Arc Stability at every setting*

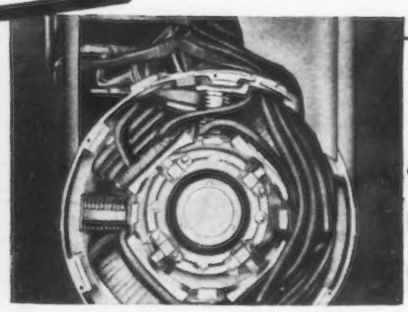
Inherent reactance, resulting from the special design of the Hobart Multi-Range Welding Generators, is responsible for the exceptional arc stability throughout their wide welding range.

No matter what the arc demands are, Hobart's exceptional arc stability will minimize spatter loss, assure good welding speed and produce good, sound joints at lower costs.

The amount of the reactance is automatically adjusted to suit the requirements of each range so that the arc will not go out when the voltage is too low and will minimize the spatter and blowing action on the bead when the current value is very high. Get a Hobart for ideal stabilization with maximum efficiency.

Go Ahead... try 'em all, then... TRY HOBART!

POLARITY CONTROL. Straight or reverse polarity selected at the flip of a finger to give best results for any type electrode. Quick reading meters give visual polarity check at all times.



COMPACT SINGLE UNIT DESIGN. 100% all-welded steel construction eliminates heavy, brittle cast iron. All rotating parts are mounted between bearings on a heavy duty shaft.

EXCLUSIVE REMOTE CONTROL is standard on all Hobart Welders, comes at no extra cost. Particularly valuable when welding at great distance from machine.

Get this new HOBART
ARC WELDING
DESIGN
SERVICE
Issued Semi-Monthly - Worth Hundreds of Dollars To You
Initial editions are FREE, if you're interested in redesigning your product for Arc Welding, and will tell us on your letterhead about your plans and present equipment.

HOBART BROTHERS COMPANY, BOX IA-632, TROY, OHIO

HOBART "Simplified" ARC WELDERS

Descriptive Catalog Ask for Yours FREE!

HOBART BROS. CO.,
BOX IA-632, TROY, OHIO

Please send me information on items checked, without obligation.

☐ Gas Drive Welder ☐ Electric Drive Welder

☐ "Practical Design" Sheets ☐ Vest Pocket Welder's Guide ☐ Complete Hobart Welder Catalog

NAME_____

POSITION_____

ADDRESS_____

Buy MORE War Bonds!

Details Nearly Completed For Disposal of Surplus Aircraft Material

• • • **Details are being** completed for the disposal of surplus aircraft materials by the Metals Reserve Co., working in conjunction with the Aircraft Scheduling Unit of WPB, the Army Air Forces and the Navy Bureau of Aeronautics. The program is the first formalized arrangement set up under the new Surplus War Property Administration headed by W. L. Clayton.

By STANLEY H. BRAMS
Detroit Regional Editor

o o o

Metals Reserve Co., subsidiary of RFC originally created to stockpile strategic materials, will carry through the physical disposition of the surpluses. The procedure it will follow is an outgrowth of a plan developed by the Materials Redistribution Branch at Wright Field. Of greatest importance is the fact that distribution will be through trade channels.

A review of a preliminary plan developed under Lt. Col. A. E. R. Peterka at Wright Field appeared in THE IRON AGE, *Mar. 23, 1944, page 102.*

All war producers listed on Schedule A of WPB Directive 16 will participate in the disposal plan. This list includes 410 contractors, and it is now being enlarged to include about 300 more, putting into the program virtually everyone in the country whose aircraft production work is significant.

These producers will use ASU Form 41 to report all surplus materials which: (a) Are inventoried, segregated and inspected; (b) are in excess of stipulated minimums; (c) are in excess of contractual requirements in all plants of the contractor; and (d) are stocks which the contractor is willing to sell.

These inventories will be divided as to government-owned and contractor-owned materials. Government-owned materials, purchased under cost plus fixed fee contracts, are of course eligible for disposition under the plan. Contractor-owned goods may also be handled under the plan when the contractor has recourse to the government due to cutbacks, engineering changes, terminations, etc. This latter proviso is expected to channel virtually all surplus aircraft materials into the disposal plan.

After obtaining these surplus inventories, which many firms are preparing now, the property disposal staff at Wright Field will offer them to the Army Air Service Command and the Navy's Aviation Supply Office for their needs. Aircraft materials taken under this screening will be moved under a transfer of accountability from the contractor plants to the service arm which requisitions them. Stocks not taken by ASC or ASO are offered to MRC on a similar transfer of accountability.

Metals Reserve, meanwhile, is making contact through its agent, Murray Cook, of New York City, to set up further agencies for handling of these surpluses. As lists are filed with Metals Reserve, these lately appointed agencies are advised of stocks in their areas. At the start, these agencies will consist largely of the approved steel, aluminum and aircraft hardware warehouses which during the war period have been handling on-the-spot stocks for aircraft contractors. Later these lists may be expanded.

Acting as agents for Metals Reserve, these warehouse facilities will inspect surplus stocks in their areas. They will take over government-owned usable and salable material by issuing shipping instructions for transfer either to the warehouse or direct to a buyer. Shipment will be on a government bill of lading, with title shifting to Metals Reserve at the destination point.

The warehouse agency may then arrange for any repairing, renovating, or classifying which may be necessary. After the sale is then made—at going market levels, for mill or warehouse quantities as the case may be—the agency warehouse deducts its service fee and sends the balance to Metals Reserve Co.

On the books this should produce good profits for Metals Reserve, inasmuch as no cost is involved except the transfer of accountability, a paper form. Actually, it is explained that inasmuch as the cost of the surplus materials has already been disbursed and figured into the cost of completed goods, any recovery is a saving and in a sense is a profit for the government.

The Metals Reserve agency warehouses may be able to get dispensations in special cases relieving them from L and M limitation orders, permitting sales to civilian outlets if any are uncovered and approved.

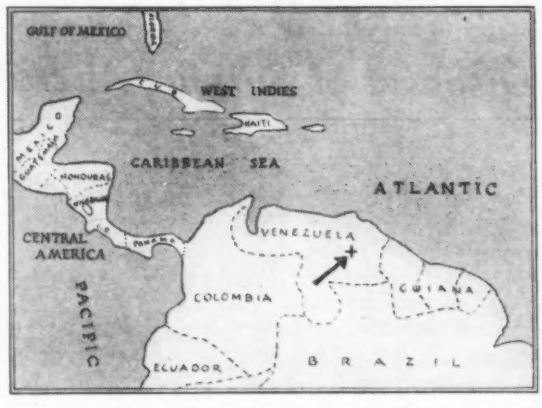
The items to be handled under this program are those on Schedule B of WPB's Directive 16. They include aluminum, copper and steel raw materials, as well as a long list of standard items of aircraft hardware and certain components. This scope may later be broadened to include other surplus aircraft materials.

Facility for quick movement of surpluses under the plan is provided by the fact that if no action is taken within 60 days on government-owned surplus materials listed in ASU Form 41, the contractor can ask the government to remove the stocks at once or can begin to charge for storage.

Materials which are examined by agency warehouses and not taken up because they are not salable may be ordered scrapped at once.

How big the surpluses are is still anyone's guess. Conceivably they will be so large that supplemental warehouse space may be required to store them as they appear. Arrangements for this are now reported being made at Wright Field. On the other hand, in the lack of positive information, the stocks may be of such a size that will permit handling without adding to the existing facilities of the approved warehouse agencies now being appointed agents of Metals Reserve.

Development Work Started on Venezuela Iron Mine Concessions



Bethlehem, Pa.

• • • **The Iron Mines Co.** of Venezuela, a subsidiary of Bethlehem Steel Corp., has started development work on a block of 16 iron mine concessions in the State of Bolivar, Venezuela, South America. The concessions, which the company is developing at its own expense, are expected to yield up to 2,000,000 tons of iron ore annually at the end of the present construction period. The ore, a hard, high-grade hematite, suitable for use in both blast furnaces and open hearth steel furnaces, will be shipped to the United States for use in Bethlehem's eastern steel plants.

The concessions, known as the El Pao mines, are located in an almost entirely undeveloped tropical jungle about 30 miles south of San Felix, a town situated near the confluence of the Orinoco and the Caroni rivers, about 165 miles from the point on the coast where the Orinoco empties into the Atlantic Ocean.

Before ore can be shipped from the El Pao mines, a port site named Palua must be completed on the Orinoco River, near San Felix. Construction now in progress at Palua is expected to be completed this year. It includes ore storage and loading facilities, a diesel-electric power plant, water works, shops, warehouses, and a complete village for housing the employees. Regular passenger and mail service is provided twice weekly by the Venezuelan Airlines, using an airport built by the company near Palua.

Because the year is divided into a wet and a dry season, the water level of the Orinoco River has a seasonal variation of 40 ft. For this reason, it will be necessary to load the ore into boats from a conveyor belt supported on a steel structure overhanging the river. The end of this structure will be high enough above the river to allow the boats to moor under it regardless of the height of the water. The ore will drop from the end of the conveyor directly into the hold of the ships.

Plans have been completed for the construction of a town named El Pao at the mines, with modern houses for about 450 employees and their families, hospital, school, stores, waterworks, telephone system, and facilities for the recreation and health of the employees. The mines are about 2000 ft. above the Orinoco at Palau and, although the location is in the tropical region, the climate is pleasant and moderate.

An improved highway and a 36-mile standard-gage railroad will connect the port of Palua with the mines. The highway has been completed, except for hard-surfacing, and the field engineering for the railroad has been done. Telephone lines have been installed between the port site and the mines.

Both open-pit and underground mining methods will be used in extracting the ore, although initially only the open-pit method will be employed. Electric shovels of 4 cu. yd. capacity will load the ore into 30-ton diesel engine trucks, which will haul it to the crushing plant. Facilities at the mines will include primary and secondary crushers, a diesel-electric power plant, warehouses, air compressors, repair and machine shops, and general offices.

At present about twenty American engineers and technicians are working on the project in Venezuela. Approximately 600 native Venezuelans, skilled as well as unskilled workers, are employed by the company.

Malleable Casting Prices Altered

Washington

• • • **OPA last week** made four changes, including one permitting sellers of malleable iron castings to add overtime labor costs to their base period prices, in the provisions governing maximum prices for this commodity. The changes, which become effective May 31, are designed to strengthen and clarify MPR-241 and to aid in enforcement of its ceiling prices. They parallel changes made in the gray iron castings regulation in March.

OPA's action involves three methods used in the trade for computing prices: (1) the "base period" method, (2) the "formula" method and (3) the "pre-base period" method.

The changes are as follows:

1—Sellers of malleable iron castings who use the "base period" method of computing maximum prices are authorized to add overtime labor costs in calculating ceilings.

2—Sellers of castings under the "formula" method are permitted to recompute ceiling prices only once on any casting sold under that pricing method. Recomputation must be in pricing the first order received after completion of the primary order for which the original maximum price was computed. Formerly, there was no limit on the number of recommendations that could be made.

3—Sellers of castings under the "pre-base" pricing method, once they have chosen to use this method to price castings 30 days after the effective date of the amendment, may not shift over to the "formula" pricing method.

4—The term "appropriate regional office" of OPA is amended to provide that where the seller owns two or more foundries located in different OPA regions, the appropriate regional office shall be the office for the region in which the seller's principal operating office is located. This definitely establishes the point where reports required by the regulation are to be filed and applications for adjustments processed.

Lake Ore Shipments Up 4,472,801 Tons over 1943

Cleveland

• • • **Shipments of Lake** Superior iron ore from upper lake ports for May, according to report of Lake Superior Iron Ore Association, were 12,036,614 gross tons from U. S. ports and 77,597 tons from Michipicoten, Canada, for a total of 12,114,211 gross tons. This is an increase of 1,139,539 gross tons over the same pernod a year ago.

Cumulative shipments for season to June 7, 1944, is 17,291,014 gross tons for U. S. ports and 111,276 tons for Canada, or a total of 17,402,290 gross tons. Shipments for the same period a year ago amounted to 12,929,489 tons, or 4,472,801 tons less than that shipped this year to date.

Plant Expansion and Conversion Continues for Top Urgency War Contracts

Cleveland

• • • **Plant expansion** and conversion are still continuing although little notice is being given the subject currently. Many of the changes and additions are affecting the steel industry directly, and many more are occurring in metalworking and fabricating plants of various kinds including aircraft component plants. In almost every instance the projects tie in with some of the present top urgency military contracts or "must" civilian programs.

Possibly the largest project in this area dollar-wise is that of Wright Aeronautical Corp., Lockland, Ohio, where approximately $14,000,000 is reported being spent to reconvert the plant to build a new super-powered aircraft engine.

The steel industry figures into the projects actively. Wheeling Steel Corp. is said to be installing heavy presses, seam, spot and acetylene welders and related equipment for the manufacture of 105 mm. shell containers. An addition to the corporation's hot strip finishing and shipping department is also necessary housing for this equipment. Wheeling is also said to be replacing an older lacquering oven with a new sanitary enamel oven to be used for coating bonderized black plate for food containers.

Republic Steel Corp. is reported spending nearly half a million dollars at its Union Drawn Division at Masillon, Ohio, to put in annealing furnaces, centerless grinders and other equipment to produce certain government specification wire, bars and shapes. Some new annealing facilities are also reported being planned at Republic's Corrigan - McKinney Works, Cleveland. At the newer Niles, Ohio, tin plate mill of Republic the reports say alterations are being made to the electrolytic tin lines to permit zinc plating continuous strip, and bonderizing.

Jones & Laughlin Steel Corp. at Pittsburgh has applied for permission to install over a half million dollars worth of forging equipment, conveyors, shot blasting equipment, etc., in preparation for the new Army shell program. This is believed going into the McKeesport plant.

The National Tube Co. at McKeesport is also reported planning to install over $3,000,000 in heating and heat treating furnaces, forging presses, shot blasting equipment, conveyors, lathes, etc., to participate in the Army's 240 mm. shell program.

United Engineering & Foundry at New Castle, Pa., is also reported in for more than $3,000,000 for a new building and facilities to produce 155 mm. shells.

Willys-Overland Motors, Inc., which has been making heavy caliber shells for some time, is scheduled to make additions to present facilities to the extent of more than half a million to increase capacity on 155 mm. shells.

Lewis Foundry & Machine Co., Groveton, Pa., is spending over quarter million for equipment to machine and assemble large caliber shells.

Standard Steel Spring Co. is putting a 125 ft. addition to present buildings and installing equipment relative to the bomb program for the Army. Cost is estimated at less than $100,000.

Less spectacular, but nevertheless real expansions are the addition to the Youngstown Sheet & Tube Co.'s pipe and coupling finishing floor which will run about $275,000.

Chicago's Plant Expansion Increases

Chicago

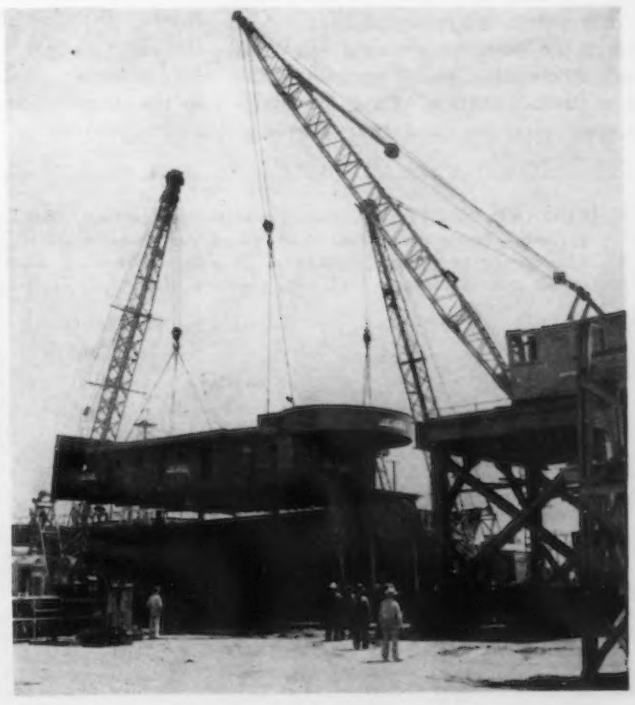
• • • **Chicago's industrial** plant facilities have been expanded by $5,745,896 in new additions during the past month, according to the Chicago Association of Commerce. This increase in Chicago's productive capacity brings total investment in expanded plant facilities here up to $42,550,746 for the first five months of 1944, and to $1,023,445,583 for the 47 months since the beginning of the war production program in mid-1940. In actual war plant construction, the Chicago area, with its more than a billion dollars investment of public and private funds, exceeds the volume of any of the country's 32 other industrial districts, according to the Association.

Companies that have undertaken expansion programs during the month include: Chicago Die Casting Mfg., Industrial Equipment, W. B. Conkey, Pratt Food, Drake Electric, Central Pattern & Foundry, Reliance Pattern, Russell Electric, Bastian-Blessing, and Westinghouse Electric & Mfg.

New plants are being erected by Industrial Condenser Corp. and Socony Vacuum Oil, while vacant facilities have been taken over by Purepac Corp., United Metal & Engineering and the Visking Corp.

Riley Steel Products Co., a new concern to Chicago, has acquired a vacant plant in Cicero for the fabrication of steel parts.

o o o



PRODUCTION LINE: *At Long Beach, Cal., this prefabricated part of an Army ship is lifted into place in the assembly line. Modern methods of production direct that most of the ship parts be built on wheels and rolled into place.*

o o o

WLB Told USWA Wage Increase Would Cost $17,514,000 More Than Claimed

Washington

• • • **The USWA demand** of 5c. an hour extra pay for afternoon work and 10c. an hour for night work and granted by WLB, would add $41,000,000 annually to the cost of steel production instead of only $23,486,000 as the union claimed, the Steel Panel was told by Nicholas Unkovic, an attorney representing Jones & Laughlin Steel Corp. and other steel companies. Hearings in the case were resumed on May 31.

Pointing out that the Board has denied the petition of other unions for shift differentials wherever this was against industry practice, Mr. Unkovic argued that WLB was without authority to approve such a grant because it would be in violation of the national stabilization laws.

The continuous character of steel operations has made it a common understanding, it was pointed out, that workers are to be employed on varying shifts when men accept employment in the industry. Mr. Unkovic declared that the union had listed 503,000 production and maintenance employees in the "basic" steel industry in December, 1943, and estimated about 60 per cent of these were on the afternoon and night shifts.

Resentment within the armed services against strikes is not to be assuaged by USWA bonus proposal Roger M. Blough, United States Steel Corp. general solicitor, told the panel.

The union had proposed that out of any wage increase granted by WLB each steelworker would contribute $20 to a "rehabilitation" fund for steelworker veterans, and that the companies should match the union contribution.

Mr. Blough said that the proposal suggests that the union will be pleased to make the gesture, if the industry will make the payment.

The union wage demand is directed against veterans instead of toward helping them because it is inflationary and will consequently work a price hardship on returning servicemen, Mr. Blough reasoned. He caustically commented that the union proposal for a soldier bonus out of the wage increase is inconsistent with the union argument for the increase—the need for more money to meet increased costs in the cost of living.

Finally, Mr. Blough rapiered the slush fund demand with the point that granting such a bonus to the steelworkers would be unfair to all other workers in other industries not similarly compensated. He said that veteran rehabilitation is a national problem to be met by the government.

John G. Keterer, Timken Roller Bearing Co. attorney, told the panel that the union's sick leave demand would add $37,000,000 in additional labor cost even if only 75 per cent of the sick leave permissible under the demand was granted.

Mr. Keterer based his estimate upon union figures submitted earlier in the hearing which showed 74.3 per cent of the 503,100 workers engaged in the production of iron and steel, have continuous service of three years or more and 15.9 per cent have one to three years.

D. K. McKamy, Birmingham, Ala., counsel for the Tennessee Coal, Iron & Railroad Co., told the panel that geographical wage differentials in American industry are so numerous and varied that their elimination by government fiat would result in upsetting the entire national economy. He said that the granting of the CIO-USWA demand for abolition of such differentials in the steel industry would disturb directly and indirectly the wage and labor policies of all other industries and would result in the closing or sharp curtailment of the operation of many plants in various sections, and more particularly in the South, with resultant unemployment.

Tool Workers Wage Rate Increased

Chicago

• • • **In settlement of** a long dispute involving 6000 workers at six Chicago plants at Foote Bros. Gear & Machine Corp., the Sixth Regional War Labor Board, Chicago, has denied any wage increases except to 11 highly skilled occupations in toolrooms and a change in the progression rate for probationary employees.

The original dispute between the company and the United Electrical, Radio & Machine Workers of America, local 1114 (CIO), was heard by a panel of the National War Labor Board in December, 1942. The National Board issued a directive order settling all issues except wages and referred these issues to the Sixth Regional WLB in Chicago for disposition.

A Regional Board heard the wage issue and a hearing was held before the National Board itself.

The Regional WLB declined to disturb the present hiring rate of 55c. an hr. and the present plant minimum of 75c. an hr. It did, however, provide that employees hired at 55c. be automatically increased to 65c. after 30 days and to 75c. after an additional 30 days.

The National Board ordered the minimum of the rate ranges for the 11 toolroom classifications increased 11c. an hr. and the maximum for the same range increased 13c. an hr.

The general increases in all base ranges of incentive and day workers were denied.

SHIPBOARD FIGHTER: *A new type British airplane that is a pusher type with a tandem wing arrangement in which the smaller wing is forward gives the appearance of flying backwards. It was designed as a shipboard fighter and initial tests have been highly satisfactory. The plane is designated the Miles-35.*

Steel Chief Calls Labor Union Wage Increase Demands "Profiteering"

New York

• • • **War profiteering** is just as wrong when done by a labor union that possesses both economic and political power, as when done by a manufacturer or a merchant, Clarence B. Randall, vice president of the Inland Steel Company, said in a radio address broadcast from New York.

Discussing the steel wage case now on hearing before a War Labor Board panel, the Chicago steel official said the C.I.O. Steelworkers Union has again asked for sweeping wage increases in the steel industry, adding:

"And, as everybody knows, in the matter of wages, as steel goes so goes the nation. You can't raise wages again in steel and not raise wages in all of our other great industries. Steelworkers cannot be made a preferred group. . . . Wages make prices. You can't raise wages without raising prices. . . .

"It is we, the steel companies, who are arguing the case, but it is you, the people, whose welfare is at stake. It is we who are resisting the wage increases, but it will be you, the consumers, who will pay the bill if we lose.

"The steel industry today has but one customer — the American people. We sell you everything we make. You put our steel into ships and tanks and guns and bulldozers and you are winning the war with it. But you have to pay us what it costs."

Calling attention that right now a new campaign is on to sell war bonds, Randall asked if loyal citizens organized for this purpose must take on an additional burden of asking each citizen to buy his regular quota and then an extra bond to cover the cost of a further wage increase.

"Shall the committee say to the citizen 'Back the Attack' for his regular quota of bonds," the speaker asked, "and then shall they say as to the extra bond, 'buy another bond so the C.I.O. Steelworkers Union may have another wage increase'? It won't be done that way but, if it were, the people would see more clearly that it is they who must pay the bill.

"Mr. Philip Murray, the able president of the C.I.O., has made it abundantly clear that the steelworkers union intends to destroy the existing control of wage rates. . . . I suggest that in doing so he is defying his Commander-in-Chief. Time and again the President has warned of inflation. He has given the most categorical instructions to the War Labor Board and to the Office of War Mobilization to hold the line. He coined that phrase to tell the American people that the public welfare demands that there be no broad wage increases. . . .

"One way to hold the line would be to have Mr. Murray carried out of his handsome Washington office by soldiers. I don't like that way, and I don't think you do."

Pointing out that the average steel wage in January of this year was $52 a week, or 73 per cent higher than in 1939, Randall said that if steel wages are substandard then the whole nation is substandard.

He asked his listeners to compare steel wage rates with the wages paid them and their neighbors, and to study the steel companies' statements, which can be obtained from the companies or the Securities and Exchange Commission, and which show that the percentage of their net profit has declined substantially.

Foundries Now Employing Women

• • • **Foundries**, despite the generally dirty, heavy and dangerous nature of the work, are already employing women to a limited extent on various jobs, according to a report issued by the Women's Bureau, United States Department of Labor. In the 13 foundries visited by Women's Bureau agents, some women were employed on nearly all production jobs, the exceptions being those involving molten metal or heavy lifting or those skills that cannot be learned in a short time.

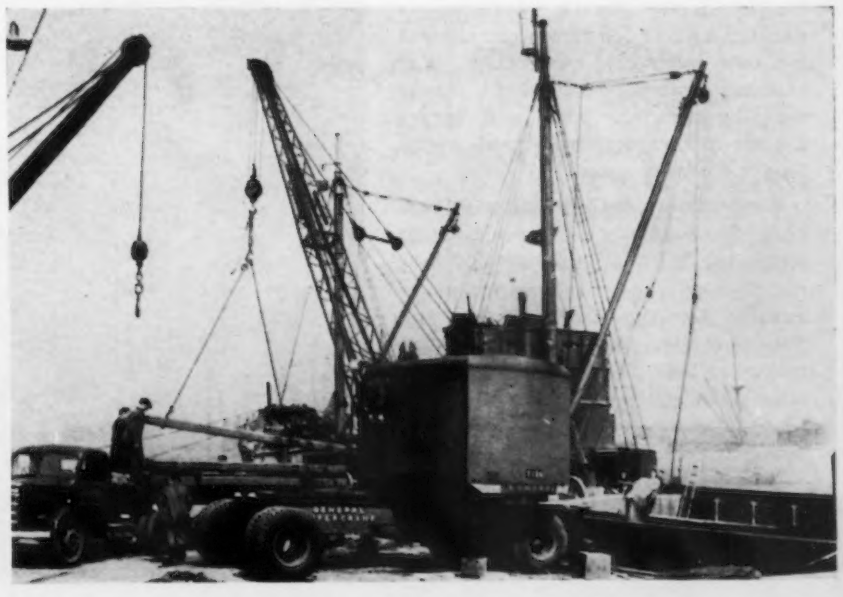
Women were found in occupations ranging from the shoveling and mixing of sand and other unskilled types of labor to fairly skilled work in the fine finishing of molds, in testing in the chemical and metallurgical laboratories, in various jobs in the finishing departments, as well as in coremaking.

Foundry jobs, for all the hard work and hazards, do not pay very high wages, with minimum starting rates for women production or plant workers concentrated at 70 to 71½c. an hr.

Rust Gets Brazilian Contract

• • • **Completing its** mill at Volta Redonda, Brazil, National Steel Co. of Brazil has awarded a contract for engineering and materials for an additional battery of two-hole, modern regenerative soaking pits for use with lean fuel to Rust Furnace Co., Pittsburgh.

GENERAL ASSISTANCE: *The General Excavator Co., Marion, Ohio, has enlisted the aid of the Philips & Davies, Inc., facilities from nearby Kenton, Ohio, to meet the demand for General Supercranes. Production is according to General specifications and is earmarked 100 per cent for the government. Here is a Supercrane in operation on an invasion front.*



ODT Allotted 1,378,524 Tons Carbon Steel for Transportation in 3rd Quarter

Washington

• • • **Requests by the ODT,** as claimant agency for transportation under CMP, were granted almost in full by the WPB in its allotments for the third quarter of 1944, the ODT has announced. The third-quarter allotment to the ODT for rail, automotive and water transportation is 1,378,524 net tons of carbon steel, with proportionate amounts of alloy steel, copper and aluminum authorized by the WPB Requirements Committee. In addition, approximately 330,000 tons from the WPB reserve, formerly claimed separately, have been granted for railroad and local transit maintenance, repair and operating supplies.

Two items in the quantities allotted to rail and motor truck transportation account for practically all of the difference between the ODT request for 1,517,108 tons of carbon steel and the amount finally authorized, ODT officials said. New replacement rail requests were cut from 560,000 tons to 500,000 tons because of military requirements for shell billets produced in certain rail mills, and track accessories were correspondingly reduced from 296,000 to 265,000 tons. Carbon steel for motor trucks and truck-tractors was reduced by 35,000 tons from the amount requested to make allotments correspond with the ODT share of the total production schedule now authorized by WPB, most of which is for military units.

An allotment of 305,000 tons of carbon steel, enough to cover all orders on hand for freight car production in the fourth quarter, was granted, and 42,500 tons were allowed for new locomotive production. For railroad marine equipment, chiefly tugs, lighters, car floats and barges needed to complete rail hauls, 5000 tons were authorized.

Recognizing the continuing critical need for automotive replacement parts, the WPB allotted 137,000 tons for this purpose—the same amount granted for the preceding quarter. For new equipment in the motor transport field, 79,580 tons of carbon steel were allotted for the manufacture of motor trucks, truck-tractors, truck-trailers, bodies and third axles.

To meet local transit needs, 21,820 tons of steel have been assigned for the manufacture of new integral buses, street cars, trolley coaches, truck chassis for bus use and bus bodies. Replacement rail and track accessories total 17,850 tons.

Material requirements for waterways were authorized at 4000 tons for the production of new towboats, tugboats, steel barges and Diesel marine engines. For maintenance, repair and operating supplies, water transport received 500 tons from the general WPB reserve.

Since the claims for transportation were almost entirely met, ODT officials urged that the allotted quotas be fully utilized by operators and manufacturers to prevent slippages from production schedules.

OPA Revises Regulation Covering Fabricated Concrete Reinforcing Bars

Washington

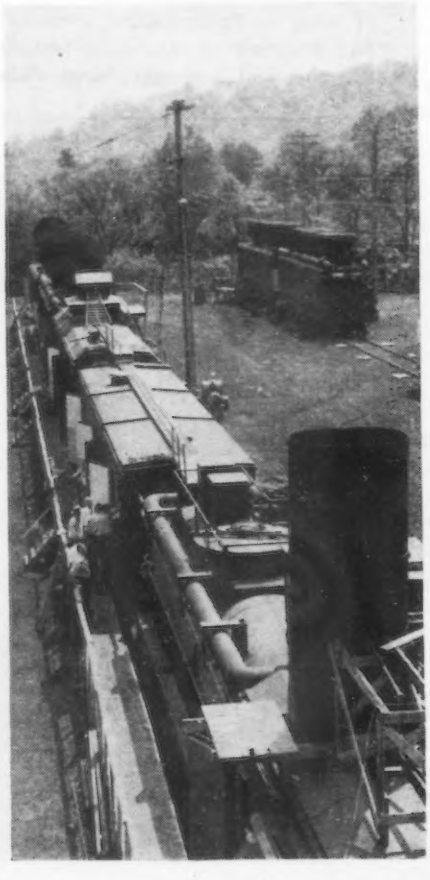
• • • **Given the same** ceilings as those already established for fabricators, OPA has extended coverage to sales by resellers in a revision of the price regulation for fabricated concrete reinforcing bars. Effective June 6, the new regulation is titled Maximum Price Regulation 159, Fabricated Concrete Reinforcing Bars. Maximum prices for sales of these bars by persons other than fabricators were formerly covered by the General Maximum Price Regulation which set the ceiling at the highest price charged during March, 1942. OPA pointed out that sales by resellers are infrequent but are made on a competitive basis with sales by fabricators and it was therefore decided to bring them under the same price ceilings.

One important pricing change was made, a reduction of 2c. per 100 lb. in the delivered price at Toledo, Detroit and Eastern Michigan, and at Gulf Port basing points to reflect the revocation of the six per cent increase in freight originally effective March 13, 1942.

In accordance with industry practice, the revised regulation established three basing points—Pittsburgh, Birmingham and Chicago—for sales of welded stirrups. Differentials were established for pricing column spirals for delivery at Toledo and Detroit and also a price for spirals when the material to be fabricated was obtained from a Pacific Coast or Gulf Port basing point.* These were not provided in the former regulation. The new regulation also clarified the conditions which determine maximum charges to be made for quantity and engineering extras where the quantities contemplated by an original order are changed.

An equitable method of calculating the freight a fabricator was allowed to retain when he did not segregate his stocks and when a substantial change in inventory occurred is established by requiring the freight adjustment to be figured on the basis of the weight of concrete reinforcing bars actually shipped.

POWER PLANT TRAIN: ***A completed power-producing train undergoes final tests on a special railroad siding at New Philadelphia, Ohio. The train, built by the Westinghouse Electric & Mfg. Co., will be shipped to Europe where it will be used by Allied invasion troops.***



Order L-197 Changes Method Of Placing Orders for Steel Drums

Washington

• • • **WPB has made** a number of changes in Steel Shipping Drum Order L-197 to facilitate the placing of orders for steel drums, to clarify further the uses for which new drums are permitted and to assure an equitable distribution.

Under the amendment, each order for steel drums will no longer require a specific WPB authorization but a blanket certification must be filed with the drum manufacturer by the customer. In Schedule A the amended order lists all commodity classes for which new steel shipping drums—perfect or reject—are permitted, and establishes the packer's drum quota for each class. This schedule includes a wide variety of chemicals, a number of food oils and greases, petroleum products and miscellaneous products. Under the new provisions, any packer may use, for Schedule A items, up to 95 per cent of the new drum weight used for the same commodity groups during the corresponding quarter of 1943. Seven classes of commodities that may have been packed in fibre drums during 1943 are now permitted the use of steel drums on a percentage basis. The commodities include paints, synthetic resins, varnish and lubricating greases. It is estimated that this will result in a saving of 130,000 tons of fibre board during 1944.

Although present quotas are slightly below usage during last year, WPB said the order will permit use of all the sheet steel that can be made available for drums and pails at this time. The supply of sheet steel for containers is limited by expanded military demands for sheet steel capacity.

Under the amended order, preference ratings may not be used in the purchase of drums unless specifically assigned by military procurement agencies. Industrial ratings are eliminated. All existing ratings, lower than AA-2-x, become void at once. Higher industrial ratings remain in effect until scheduled orders are delivered. This action is expected to facilitate deliveries, WPB said.

Purchasers of new steel drums, perfect or rejects, are permitted 60-day inventories by type of drums, or total inventory of one and one-half carloads, whichever is greater.

Canadian Steel Output in April Drops

Toronto

• • • **While production of steel** ingots and castings in Canada for April fell slightly below the total reported for March, pig iron output rose to the highest record since November, 1942. During April production of pig iron amounted to 170,364 net tons, which is 74 per cent of total rated capacity, and compares with 168,047 tons in March and 150,486 tons for April, 1943. Production for the month under review included 147,391 tons of basic iron of which 129,681 tons were for further use of producing firms and 17,710 tons for sale; 7693 tons of foundry iron all for sale and 15,280 tons of malleable iron, all for sale. Throughout the month 10 furnaces were in blast, one banked and three blown out to make a total of 14 stacks in the Dominion.

Pig iron output for the first four months of the year amounted to 612,417 net tons, a gain of 8.3 per cent over the 565,154 tons reported for the same period last year, but fell below the all time record made in the corresponding period of 1942 when 634,653 tons were produced.

Ferro alloys in April showed the lowest monthly output in more than two years, amounting to 12,818 net tons, compared with 13,427 tons in March and 18,698 tons in April, 1943. For the four months ending with April, production of ferro-alloys totaled 57,460 net tons, which compares with 75,671 tons in the same period last year, a new peak record.

Production of steel ingots and castings in April fell to 260,825 net tons from 275,539 tons in March and compares with 264,357 tons in April, 1943. The month's output included 250,157 tons of steel ingots and 10,668 tons of steel castings. For the first four months this year production of steel ingots and castings totaled 1,008,402 net tons, a gain of 2 per cent over the 987,915 tons reported for the same period last year and was only slightly below the peak record of 1,032,828 tons made in 1942.

BOMB SURGEONS: *Workers at the Firestone-operated Nebraska Ordnance Plant, Omaha, saw open bomb for inspection of its interior. The T.N.T. has been removed from a two-piece mold resembling a bomb. The men don't consider their job particularly dangerous.*

FEA Adds 175 Items To "Blanket" License List

Washington

• • • **FEA has notified exporters that** 175 items in 12 different commodity groups have been added to the list of commodities exportable under FEA's new "blanket" license. Under the blanket license procedure, designated commodities may be shipped to more than one consignee in any Latin American country that does not require import recommendations for the commodities shipped.

FEA Current Export Bulletin 164, mailed to exporters May 20, names the general categories of commodities within which the 175 items are designated. Among them are:

Brass, bronze, copper, electrical machinery and apparatus, iron and steel manufacturers (cutlery, hardware, tools, wire, stoves, structural products, miscellaneous), machinery (agricultural implements, construction, conveying, industrial, metal working, power generating, vehicles—automotive parts and accessories), and valves. Items designated under the foregoing categories are added to the list of commodities announced to the export trade in Bulletin 158.

WLB Grants $1.50 Monthly Check-Off for USWA at Inland Steel Corp.

• • • **The WLB last** Thursday granted a request of the CIO-USWA that the Inland Steel Corp. check-off $1.50 a month dues for members of the union at the corporation's Chicago Heights, Ill., plant, instead of $1 which the corporation has been deducting under order of the board in the Little Steel decision.

The board's order directing the corporation to increase the dues deduction was based on a report of a tripartite panel that the local union had voted for the dues increase and had informed the board of the vote in conformity with a WLB resolution of Oct. 20, 1943. Industry members of the board dissented.

On Oct. 20 the board adopted a resolution with reference to the check-off provision in some of its directive orders affecting locals of the USWA, taking into account the change in the union's constitution permitting local unions to increase dues up to $1.50 a month. The resolution instructed the board's director of disputes to authorize any company covered by the directive orders to increase the amount of dues checked off when the local unions so voted and certified the results of their vote to the WLB.

After the local at the Chicago Heights plant had complied with the conditions laid down in the resolution, the WLB authorized Inland Steel to increase the amount of the check-off, but the corporation declined to avail itself of this authority, WLB said. The union, following this action of the corporation, petitioned the WLB to amend the directive order of June 16, 1942, which set the amount of dues to be checked off at $1 so as to provide for a check-off of $1.50. The WLB panel recommended that in view of the union's conformance with the WLB resolution, the petition be granted.

Serious Concern Expressed Over Future Industry Manpower Prospects

Washington

• • • **Asserting that** neither labor nor equipment in the iron and steel industry can much longer stand the grueling pace, particularly of recent weeks, members of the Iron and Steel Industry Advisory Committee at a meeting here last week, expressed serious concern over future manpower prospects for the industry.

WPB officials and committee members agreed, a WPB statement said, that following a period during which it had appeared that steel supply had reached a relatively comfortable position, unexpected demands, such as the greatly expanded high-caliber shell program, stepped-up troopship construction and the great quantity of tin plate needed to pack the 1944 farm crop, again have made the situation acute.

Explanation of WMC's policies and procedures was made by Lawrence A. Appley, WMC deputy chairman and executive director, following which came a general discussion of the situation facing the industry. One member reported more than 3000 16-hr. day turns worked in one week. Other members reported resort to the 16-hr. day and the use in production activities of workers normally employed in maintenance operations. In this connection, it was pointed out by Mr. Appley that 32 per cent of all categories of steel workers had been drawn into the armed services as against a national industrial average of 27 per cent.

Further whittling away of the labor force, industry members said, would inevitably have an adverse effect on the rate of production, already 5 per cent below that of the second quarter. Furthermore, they said, the coming hot weather will seriously affect output by the present force and that unless some relief is granted it would be difficult, if not impossible, to meet all demands of the military services, plus essential civilian requirements.

Charles E. Wilson, WPB executive vice-chairman, said it was essential that the greatest possible production be attained and that all steel is going to military and basic civilian requirements. Mr. Wilson added that within the complex framework of the overall manpower situation, everything possible will be done to assist the steel industry.

Leading the discussion for the committee members were Eugene G. Grace, president, Bethlehem Steel Co., and Benjamin F. Fairless, president, United States Steel Corp.

On the bright side of the picture were reports by Steel Division officials that supplies of ore will be adequate to meet estimated requirements and that, in general, the raw materials situation is not a current source of anxiety.

New Renegotiation Regulations Issued

Washington

• • • **The War Contracts** Price Adjustment Board has issued new renegotiation regulations. These new regulations, with revisions of four chapters originally issued on April 19, complete the initial basic codification of the first detailed rules to be publicly issued in connection with renegotiation of war business done by contractors in fiscal years ended after June 30, 1943.

Chapter III of the new regulations deals with determination of renegotiable business and costs; Chapter IV deals with the determination of excessive profits; Chapter V covers the form and content of agreements between the government and contractors, clearances where no excessive profits appear and statements to be furnished to contractors upon their request under provisions of the new act; Chapter VI, devoted to impasse procedure, likewise takes up proceedings for the redetermination of excessive profits by the tax court of the United States under powers conferred on the court of the new Renegotiation Act.

It is expected that the Superintendent of Documents will publish the regulations in loose-leaf form and will make them available to the public at a subscription price of $2, which includes 12 monthly supplements embodying revisions, which will be made by the War Contracts Board from time to time, the board said.

Mason Britton Appointed Head Machine Tool Division

Washington

• • • **Mason Britton,** vice-chairman of the McGraw-Hill Publishing Co., has been appointed as head of the machine tool division of the surplus war property administration. Mr. Britton organized the machine tool division of OPM, now the WPB, and served as head of that division from June, 1940 to January 1, 1942.

Wage Panel Shown That Innumerable Demand Variables Prohibit "Leveling Out" of Steel Production

New York

• • • **Kemp G. Fuller**, manager of market research, U. S. Steel Corp. of Delaware, in testifying before the National War Labor Board Steel Panel in behalf of Carnegie-Illinois Steel Corp., and other steel producers at the wage hearings, discussed *"Markets for Steel and Their Effect on Steel Production."* In discussing the claims of the CIO-USWA that the steel industry produced on a "planned basis" during the war and other such claims, Mr. Fuller offered statistical proof that, under normal conditions of demand, production of finished steel products for stock is possible only to a very limited extent.

He divided his discussion into four parts: 1—The nature of markets and the demand for steel. 2—Possibility of methods to control variable demands so as to permit a more constant rate of steel operations. 3—Problems that would be involved under an assumed constant rate of operations without immediate delivery to steel customers. 4—The agreed-upon desirability of regularizing production and a description of steps already taken.

In his discussion of the nature of markets and the demand for steel, Mr. Fuller offered graphic data as evidence that the steel industry is subject to the extremely complex and varied demand pattern of millions of people who express their individual choice as to type of product, volume, and time of purchase. "Individual steel companies and individual steel mills are subject to far greater variations than reflected by the total industry figures," he said. The magnitude of the variations in demand for steel products precludes the possibility of their speculative production without firm orders, with certain exceptions principally in wire products and standard pipes. Nevertheless, efforts of the steel industry to level out production, where possible, clearly reflect that the industry considers it desirable and has already taken steps to regularize operations.

Seven charts were offered by Mr. Fuller to support his contentions. These charts showed: 1—Production of Steel Ingots and Steel for Castings; 2—Production of Passenger Cars and Trucks in the United States; 3—Heavy Engineering Awards; 4—Shipments of Freight Cars; 5—Oil and Gas Well Completions; 6—Steel Industry Production By Products; 7—Steel Industry Production of Wire and Wire Products.

Chart No. 6, covering Steel Industry Production (see following pages) translates from 1934 to date the varying demands of the steel buying industries into terms of steel products. The graphic presentation represents groups of classes of products, and if such groups were shown in their many subdivisions such as line pipe, standard pipe, mechanical tubing, and boiler tubing, which are included in the pipe and tubes group, as well as the multitude of different other products, the chart would be completely illegible.

Mr. Fuller pointed to one group on the chart — tinplate — as the least complex steel products as to types manufactured. Tinplate enjoys a rather stable market demand, yet the total peacetime demand varies in the space of about a year by more than 100 per cent. Under tinplate is included the many weights of steel which are in turn coated by different thicknesses of tin. Even those two sets of variables are not the only ones involved, as there are differences of temper and shipping sizes and many other technical variations.

The point of bringing out the characteristics of this relatively stable product is to show that the tinplate production line on the chart could be split into so many sub-groups with so many variations in demand that a detailed breakdown is almost impossible. In view of such variable factors, the question arises as to how far ahead an individual steel production demand can be forecast. Mr. Fuller pointed out that if any part of the chart is covered and an attempt is made to predict the prospective demands for steel products the task is hopeless.

Chart No. 7 of Mr. Fuller's presentation, which breaks down the Steel Industry's Production of Wire and Wire Products (see following pages) deals with wire products from 1934 to date, and breaks down the single line shown on the preceding chart into its major components. This chart was prepared to demonstrate the great variety of products which are included in only one of the product group lines on the Steel Industry Production chart under the general classification Wire and Wire Products.

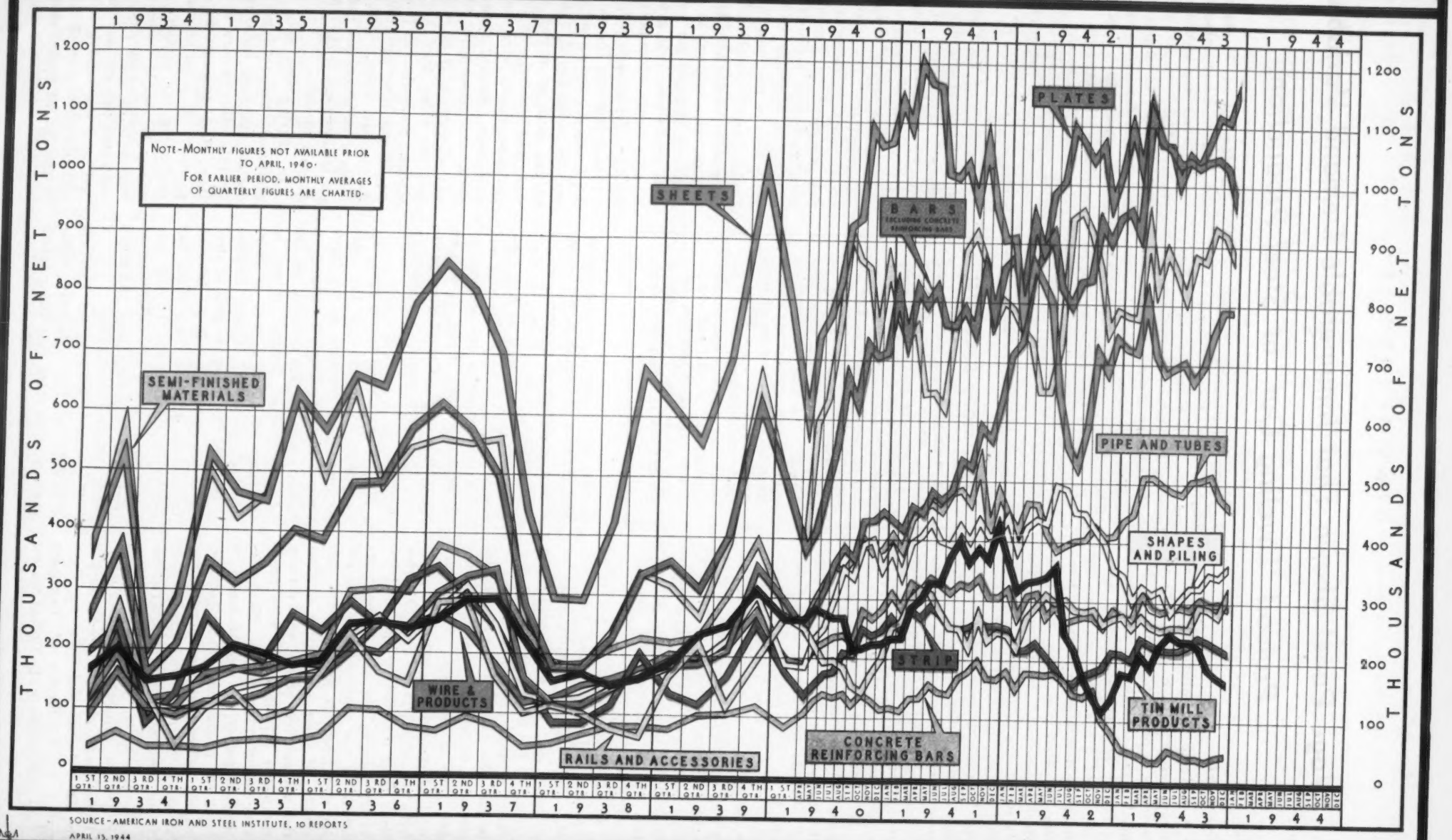
While wire products as a group account for about 6 per cent of total steel production, that group is more familiar to the ultimate consumer in the many forms such as nails, screws, screen, fence, etc. The chart shows a sub-group for drawn wire, which, in turn is made up of numerous subgroups, such as spring wire, music wire, book binders' wire, florists' wire, pin wire, broom wire, and wire for steel rope, welding rods, and wire cloth. All these wires are different and all necessarily so because of the uses to which they are eventually placed. Similarly, the fence, nail and staple, and other sub-groups are further broken down. All these thousands of variations are needed to meet the requirements of the different users of such products.

In offering this data, Mr. Fuller concluded that a "Super Board" to control the steel industry would be of little value in view of the factors that effect demands for steel mills products. It is not only a question of controlling the actions of the steel mills. It would involve complete regimentation of all industries and exports and imports, and complete control over the actions of 136 million ultimate consumers of steel products in the United States alone.

Testimony Excerpts:

• • • Considering peacetime years, about 90 per cent of steel tonnage is used for capital and durable goods as contrasted consumer goods classified as non-durable. . . . The automobile industry in peacetime consumes between 15 and 25 per cent of the total steel produced. . . . The construction industry in peacetime takes from 15 to 20 per cent of total steel produced. . . . Non-railroad car-building shops account for 10 per cent of steel production. . . . Oil and gas industry steel consumption averages more than 7 per cent of production in peacetime years.

STEEL INDUSTRY PRODUCTION

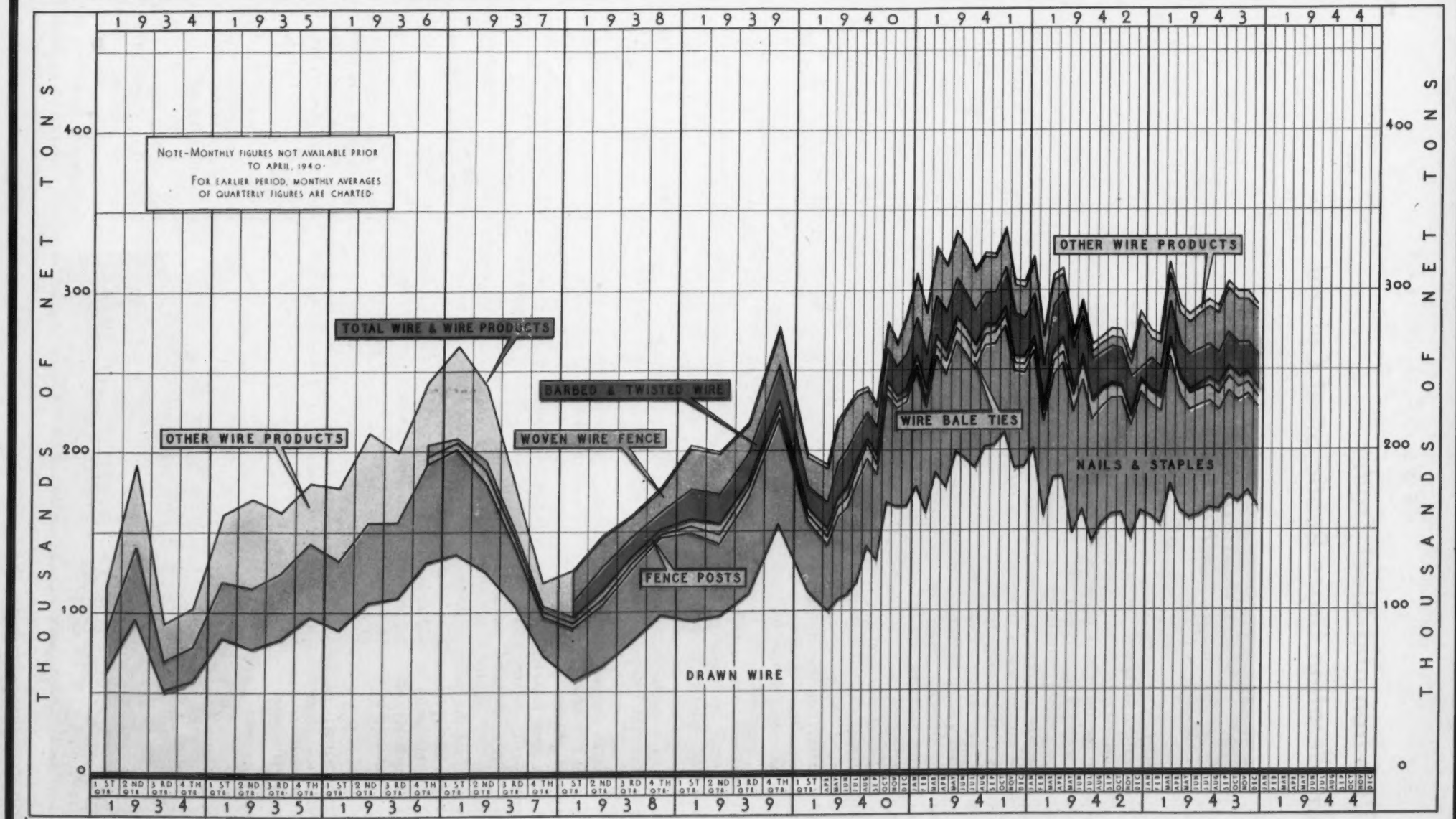


SOURCE-AMERICAN IRON AND STEEL INSTITUTE, 10 REPORTS

APRIL 13, 1944

STEEL INDUSTRY PRODUCTION FOR WIRE AND WIRE PRODUCTS

STEEL INDUSTRY PRODUCTION FOR WIRE AND WIRE PRODUCTS



SOURCE-AMERICAN IRON AND STEEL INSTITUTE, 10 REPORTS

APRIL 25, 1944

Courtesy of Steel Case Research Committee

British Iron and Steel Trades Confederation Urges Public Steel Control

o o o

By HERBERT TRACEY
Britain's Trade Union Congress

o o o

• • • **Organized workers** in the iron and steel industry in Britain place their hopes for the future upon an expanding industry maintained and controlled by a public corporation or some similar form of public organization, imbued with the spirit of maximum service to the community. Thus John Brown, general secretary of the Iron and Steel Trades Confederation, defines the principles upon which unions in that industry wish to see it develop after the war.

Divisional Conferences of the Iron and Steel Trades Confederation have been discussing the postwar future of the industry from this standpoint. A resolution common to all these divisional conferences affirms the view that it is "essential in the national interest that immedite steps shall be taken to secure the transfer of the iron and steel industry from private control and ownership to control and ownership by a public corporation." As this resolution indicates, nationalization of the industry is regarded by the union as the best solution for the postwar problems.

Under the present system of conducting this great industry, the union anticipates only minor postwar changes. These changes, generally speaking in the union's view, will simply continue the policy of protection which has operated in it since 1932. By this policy it is assumed that a reasonably efficient industry can be maintained in Britain, capable of producing about 12,000,000 tons of raw steel each year.

On its manufacturing side, the industry is well federated both nationally and on an international cartel basis. The steel cartel, before the war, was one of the few cartels which had successfully divided up the international market for steel among their members. It was constituted in a new form in June, 1933, when its original members — the steel producers of France, Germany, Luxembourg and Belgium — were joined by Czechoslovakia, Hungary and Austria and a year or two later by Poland and Britain. Under the constitution of the cartel, the home market of each member country was reserved to it, and each nation had a share of the export market according to a specified percentage of the basic tonnage program.

In Britain itself the Iron and Steel Federation as a combination of producers, exercised a considerable degree of central direction which aimed at bringing larger and better integrated units of production into being.

The Union of Iron and Steel workers foresees that the present directors of the Iron and Steel Federation may aim at increasing their influence over the industry and at extending the measure of control they have acquired during the war years. To prevent this the union has framed a program which aims at diverting the industry from the path of a privately owned and controlled monopoly to one that will lead to the conversion of the whole industry into a public service. The union takes as its guiding principle the necessity of enabling the industry to stand on its own feet, and to have the chance of producing iron and steel as economically and efficiently as the industry of any other country, without need of the kind of protection accorded to it after 1932.

Steel workers, the union secretary says, are not hidebound political theorists. They apply their common sense to the problems that confront them. They have seen the iron and steel industry in Britain reestablished and reconstructed by government assistance, direction and control, and they fear a reversion to unregulated private enterprise. They therefore propose, in the union secretary's words, that "further steps shall be taken to perfect the machinery of direction and control within the industry, and it is their considered view that a public corporation can best serve the interests of the community and expand the output of an industry which is an essential part of our national economic system."

The union does not minimize the difficulty of reorganizing an industry so diversified as iron and steel manufacture. Although production appears to be concentrated in a reasonably small number of large units, the productive processes are by no means so simple. The industry itself consists of 10 or 12 different branches, each of which is an important industry in its own account. Many producers in the industry have closer relations with concerns in other industries, relations which have arisen from their need of raw material supplies or from the marketing arrangements for their output. After full consideration of the complexity of the industry the Iron and Steel Trades Confederation has framed a scheme for the establishment of a British Iron and Steel Corp., which has received the endorsement, not only of its own members, but of Britain's Trades Union Congress.

Briefly the union proposal is that a scheme shall be enacted by Parliament to set up a public corporation, empowered to take over, as from an appointed day, all the plants manufacturing iron and steel products, from pig iron up to the finished products of the industry. Terms of transfer of the existing properties to the control and operation of the proposed corporation, would be laid down in

(CONTINUED ON PAGE 122)

ROUGH GOING: *This armored prime mover pulls a 240 mm. howitzer into position over rough terrain somewhere on the Italian front. These big, mobile field pieces are rugged enough to come through the most difficult areas with comparative ease.*

New Rocket Gun Features Light Weight and High Demolition Power

By DONALD C. MACDONALD
Regional Editor

Cleveland

• • • **The hushed talk** about rockets as used by the Allied armies has caused somewhat of a misunderstanding of their theory, scope of usefulness and purpose. The rocket, according to military men, has a very broad usefulness but does not replace, in the full sense of the word, any other weapons we may be using, including heavy artillery or anti-aircraft weapons. It does have several specific purposes and is definitely beyond the development stage.

Primarily, the rocket seems to have been developed because it could do a wide variety of tasks with a minimum of weight. It will replace artillery to some extent under certain conditions; it has been very successful as an anti-aircraft weapon; and new uses are rapidly being advanced. Up until about a year ago rocket accuracy has not been satisfactory but this is believed to have been corrected in view of the contracts that have been made for rocket construction.

The rocket offers the advantage of a tremendous weight saving. This is not in the shell itself but in the light and freely expendable launching devices required. The launching tubes are frequently made of light, thin walled materials. Multiple mountings of launching tubes are also being used in many applications. Each of these launching devices offers a vast weight saving over the gun which would be required to fire a shell of comparable demolition power.

A second major advantage of the rocket lies in its near total lack of recoil when fired. This advantage recommends it for use by aircraft in place of heavy cannon which have been built into planes of the last year or so. Instead of cramping the fuselage space of a plane with a heavy cannon, requiring many special adaptations to plane design to accommodate the extra weight, shift of center of gravity, and to withstand the terrific recoil, rocket tubes can be mounted under the wings, evenly distributing the weight and offering "big gun" punch with small and expendable equipment.

The lack of recoil is an added factor which has been amply illustrated in the "Bazooka" rocket launchers. The "Bazooka," firing a 2.36 in. rocket can easily be held by one man and the slight recoil at the instant of firing has been shown to be negligible.

Theoretically, the rocket principal is simple although a great many functional and metallurgical difficulties had to be overcome to gain anything like satisfactory performance. The theory was long ago defined by Newton in his third law of motion, namely, that every action has an equal and opposite reaction. In the case of ammunition the propelling power is outside of the projectile itself and locked within the chamber of the gun. When the explosion loses this power it reacts equally against the projectile and the breech of the gun, causing the gun to recoil and at the same time propelling the only movable object, the projectile.

Entirely opposite of this, the propelling power of the rocket is within the projectile. Hence, when the propelling power is released it takes the course of least resistance and rushes out of the venturi of the rocket causing a reaction in the opposite direction to its escape which results in propulsion of the whole projectile but causes no recoil.

The rocket also has some undesirable natural characteristics which are being overcome. One is its inherent inaccuracy both as to range and lateral destination.

The range has been a problem of suitable propelling fuel. While little can be revealed about the developments in this direction it recently has been learned that rockets are being tested at the same ranges as comparable caliber cannon. Rockets have a take-off charge and are carried by momentum from there onward. Stabilization of these fuels under all climatic conditions has been one of the designer's problems. Actually the charge on the modern rocket is expended within about 1/5 of a second. Its velocity is estimated to be from ½ to ¾ of a shell's velocity during flight.

A second feature responsible for a certain measure of inaccuracy is the fact that rockets are non-rotating projectiles. While the shell projectile bores its way through the atmosphere under the whirling impetus of the gun's rifling, the rocket is practically lobbed like a mortar shell and glides to its destination. This permits wind currents and other forces to play a greater part in distracting its flight course. Unlike the mortar shell, however, the rocket does not follow an arched trajectory but rather follows an almost flat line or at most a flat parabolic course.

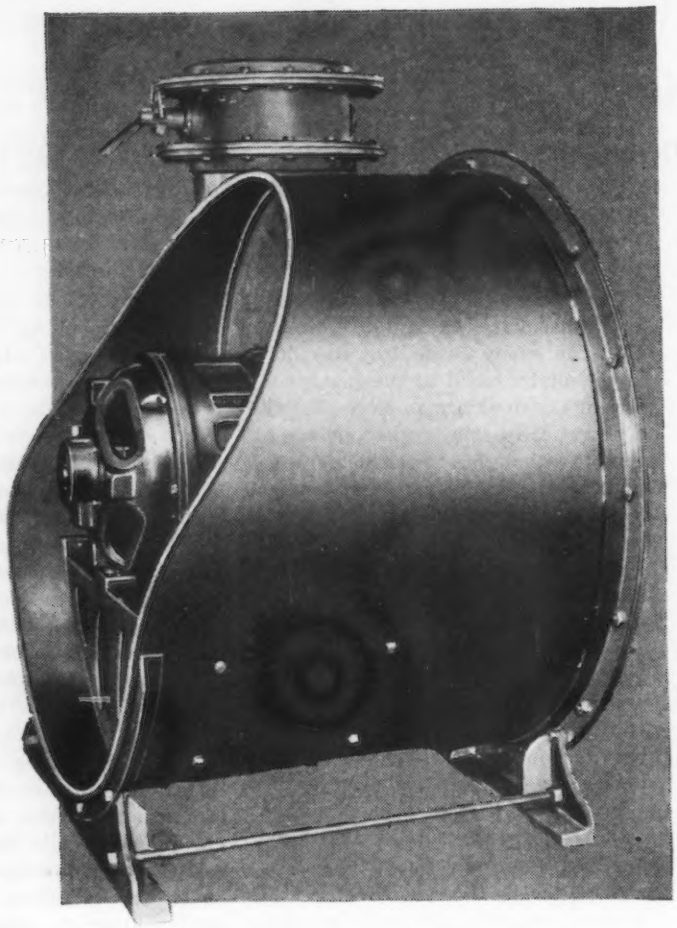
In piercing powers rockets are slightly inferior to shell due to lower velocity; in destructive power they are approximately the equivalent of a comparable caliber of shell. Their advantage lies, however, in ready accessibility to bad terrain through lightweight and easy mobility. Also to wide adaptability.

Rockets are at present known to be highly successful as anti-aircraft weapons. A rocket burst within 50 yd. of a bomber is said to have fatal effect. Rockets are doubling for artillery in inaccessible places and where light weight (such as on fighter planes and small boats) is necessary. Rockets are serving to good effect launched from PT boats and landing craft.

Since the rocket body can be adapted to many individual types of shells it can employ high explosive, concrete piercing, smoke producing and chemical shells of all kinds and is more recently being adapted to ground signal work.

HAND GRENADES: *A worker applies varnish to the center pieces of hand grenades in a Canadian Army workshop. The center piece holds the detonator and fuse. Application of varnish, inside and out, protects against corrosion.*

- ANNEALING
- BAKING CORES AND MOLDS
- BAKING PORCELAIN
- CORE OVENS
- HEATING BILLETS
- HEATING FOR FORGING
- HEAT TREATING GEARS
- HEAT TREATING PARTS
- HEAT TREATING TOOL STEELS
- MELTING
- NORMALIZER
- SPHEROIDIZING
- STRESS RELIEVING



Select any industrial process involving oil or gas-fired equipment, and you will find that Spencer Turbos are prominent in that field.

Pick any one of the leading manufacturers of heat-treating equipment and you will find that Spencer Turbos have been their preference for many years.

The reasons: A simplicity of design—as simple as a fan, as sturdy as a bridge—with wide clearances and only two bearings to grease—plus automatic maintenance of pressure regardless of load. These and many other facts are contained in the Spencer Bulletins and the Spencer Turbo Data Book—Yours for the asking.

SPENCER
HARTFORD

THE SPENCER TURBINE COMPANY • HARTFORD 6, CONNECTICUT

TURBO-COMPRESSORS

Clayton Announces WPB Cooperation In Property Disposal

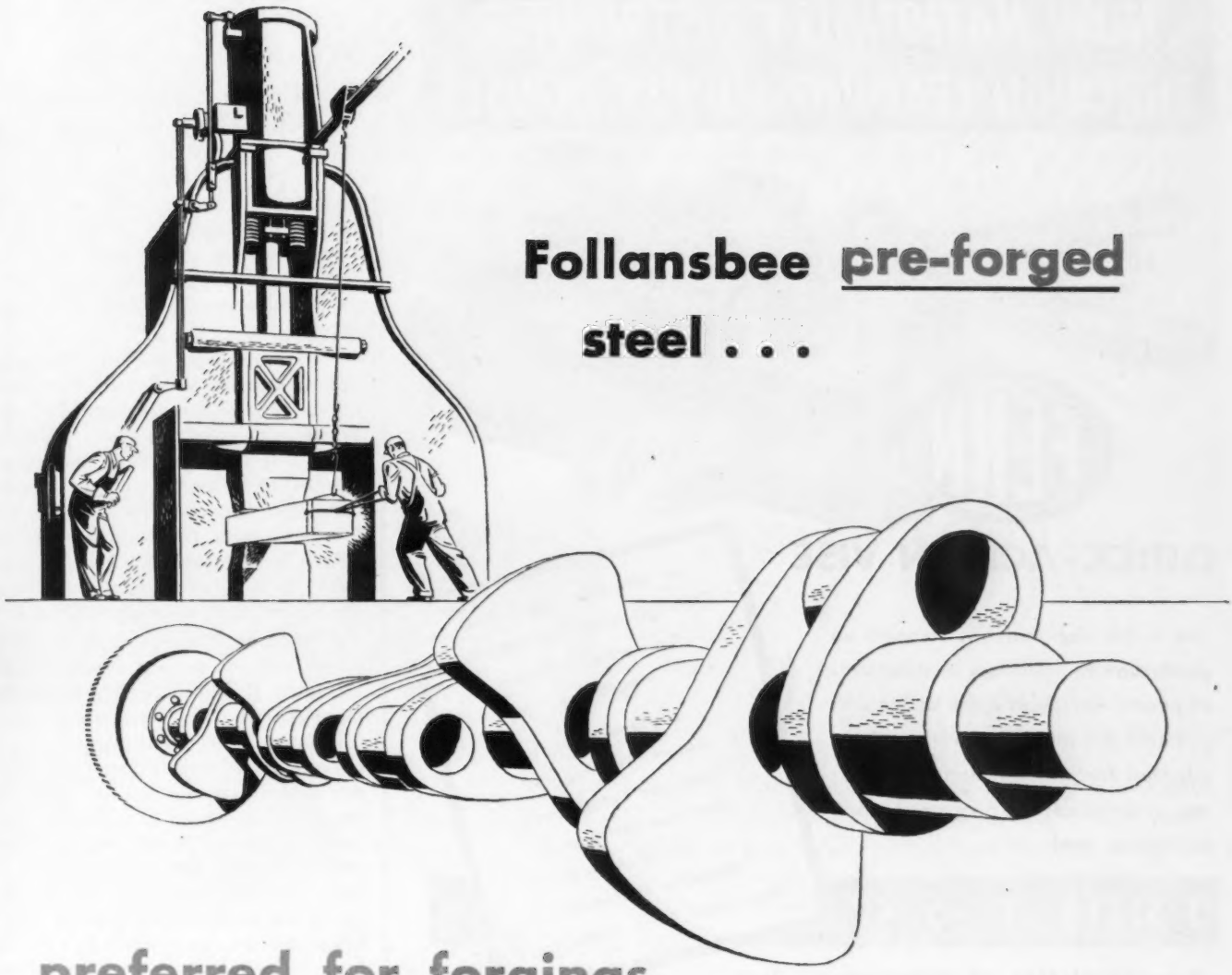
• • • **W. L. Clayton,** Surplus War Property Administrator, has announced that WPB will cooperate with the procurement agencies of the armed services in disposing of property left over from terminated contracts. The board's 13 regional offices will endeavor to find buyers who are permitted under WPB regulations to purchase such surplus materials. Each regional office will have on file a list of property available in its territory and offerings will be made therefrom in conformity with the price policy recently established by the SWPA.

W. L. CLAYTON

The materials to be listed with WPB will consist of raw materials, semi-finished goods and scrap, and will include steel, copper, aluminum, chemicals, textiles and lumber, as well as purchased parts and supplies. Contracting officers for the procuring agencies are already taking action to dispose of this material to the contractor whose contract has been terminated and to other contractors who are engaged in war production, SWPA said.

WPB, through its regional offices and contracts with industry, is in position to put buyers who are in need of materials in touch with contractors and agencies who hold the surplus materials, thus accomplishing the dual purpose of providing needed materials for essential production and aiding in surplus disposal, SWPA said. These WPB regional offices, assisted by their district offices, are currently arranging for the movement of approximately 30,000 tons of surplus steel and large quantities of other materials weekly.

Mr. Clayton emphasized the necessity for clearing this left-over material out of plants so that other war production or essential civilian production may be resumed without interruption.



Follansbee pre-forged steel . . .

preferred for forgings

Some of the country's most important manufacturers of forgings—and many smaller forge shops—are numbered among Follansbee customers. Their products require sound alloy steels to begin with . . . and the Follansbee Pre-Forging process assures this desirable characteristic.

Pre-Forging—a process unique among the nation's steelmakers—is the *forging* of ingots into blooms and billets. Follansbee alloy steels start with a uniform density and grain structure which respond so well to finished forging operations.

Preferred for forgings, Follansbee's Pre-Forging brings these same qualities to its alloy steel bars, sheets and strip . . . giving you every advantage in getting your product off to a good start.

Specify Follansbee Pre-Forged alloy steels.

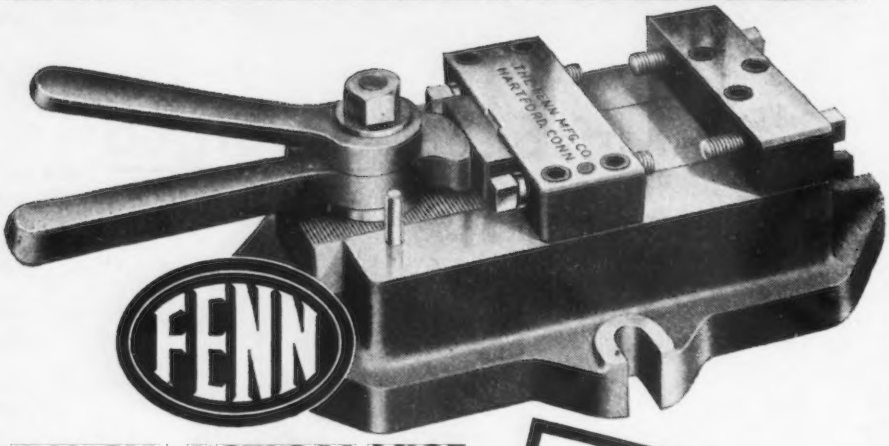
FOLLANSBEE STEEL CORPORATION

GENERAL OFFICES • PITTSBURGH 30, PA.

Sales Offices—New York, Rochester, Cleveland, Detroit, Milwaukee. *Sales Agents*—Chicago, Indianapolis, St. Louis, Nashville, Los Angeles; Toronto and Montreal, Can. *Plants*—Follansbee, W. Va. and Toronto, O.

ALLOY BLOOMS, BILLETS, BARS, SHEETS & STRIP • COLD ROLLED SHEETS & STRIP
POLISHED BLUE SHEETS • ELECTRICAL SHEETS & STRIP • SEAMLESS TERNE ROLL ROOFING

NOW NATIONALLY DISTRIBUTED THROUGH LEADING SUPPLY HOUSES



QUICK-ACTION VISE

This is the vise that has stepped up production of war work in thousands of plants. Combines quick action with powerful gripping pressure; precision adjusted for uniform, accurate holding; unexcelled for any small-parts production work.

For MILLING, DRILLING, TAPPING, and ASSEMBLING Operations in these Industries:

Airplane Engines
Automotive Engines
Guns and Small Arms
Precision Instruments
Tool Making
Electrical Equipment
Any Small Parts Production

3 SIZES: 4" • 5" • 7"

A partial list of suppliers who are prepared to give you service. If your territory is not listed, write us direct.

Dillon Supply Company
Raleigh, North Carolina

The Globe Machinery & Supply Co.
Des Moines, Iowa

The Hardware & Supply Company
475 - 535 South High Street
Akron, Ohio

The Jennison Hardware Company
Bay City, Michigan

Kasper & Koetzle, Inc.
563 - 565 - 567 Bushwick Avenue
Brooklyn 6, New York

Langdon Supply Company
1317 - 19 Union Avenue
Kansas City 7, Missouri

Lewis Supply Company
Main at Butler Street
Memphis, Tennessee

The C. S. Mersick & Company
P. O. Box 1690
New Haven 7, Connecticut

Mill & Factory Supply Co.
Toledo, Ohio

C. T. Patterson Company, Inc.
P. O. Box 640
New Orleans 7, Louisiana

Peden Iron & Steel Company
P. O. Box 1891
Houston 1, Texas

Henry A. Petter Supply Company
Paducah, Kentucky

Root, Neal & Company
P. O. Box 17 Station D — Zone 10
Buffalo, New York

The South Bend Supply Company
South Bend 24, Indiana

Strong, Carlisle & Hammond Co.
1392 West 3rd St.
Cleveland 13, Ohio

Theo C. Ulmer, Inc.
S. W. Corner Richmond St. &
East Columbia Ave.
Philadelphia 25, Pennsylvania

The Vonnegut Hardware Company
420 W. Maryland Street
Indianapolis 9, Indiana

CANADA
Northwest Industries Limited
10626 - 101st Street
Edmonton, Alberta, Canada

THE FENN MANUFACTURING CO.
HARTFORD, CONNECTICUT

Westinghouse to Use World Organization To Enter Import Field

• • • **The Westinghouse** Electric International Co., which for more than 25 years has operated in the international field as an exporter, has now entered the import field according to an announcement by John W. White, president.

"We propose to use our world-wide organization as the basis for conducting a general import business," Mr. White said. "By this move, Westinghouse will do its part in furthering reciprocal trade among nations. Instead of the old 'one way street,' we propose to open a wide two-way highway for future foreign trade." Later the company plans to offer representation in the United States for firms abroad.

Explaining the company's new economic attitude toward foreign trade, Hampton C. Marsh, newly appointed manager of the department, said: "Although our new department will operate as a separate activity from our export business, we are sure that the two-way traffic it will cause will make it far easier for our company and America's customers abroad to carry on most profitably. It is certainly not beyond the realm of possibility that we can eventually ease the business terms which were so restrictive in the prewar era.

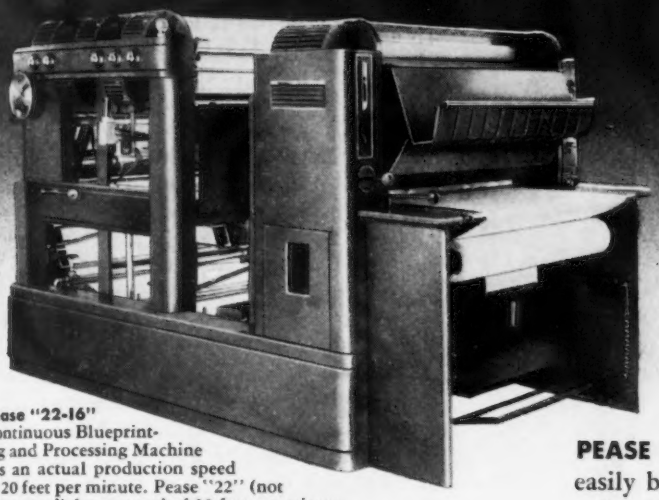
Mr. Marsh added that the new Import Department feels that arrangements can be worked out to enable foreign firms to buy in this country and pay for what they buy with their own local products. He said that it is expected that most of the company's imports will be raw materials, with few manufactured articles brought in, adding: "We will make careful studies to avoid importing goods which will compete with American industry. We wish to assist domestic industry by making available products from abroad at the same time that we help other countries develop their local resources.

Chemical Dictionary Available

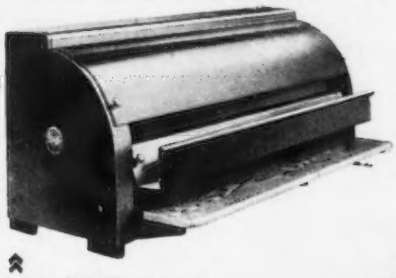
• • • **A chemical dictionary** containing words generally used in chemistry and related sciences such as physics, medicine, engineering, etc., is being offered for sale by the Blakiston Co., Philadelphia, for $12. This dictionary includes numerous tables, diagrams and illustrations and many of the 57,000 definitions are of interest to steelworks chemists.

Printmaking Adaptability

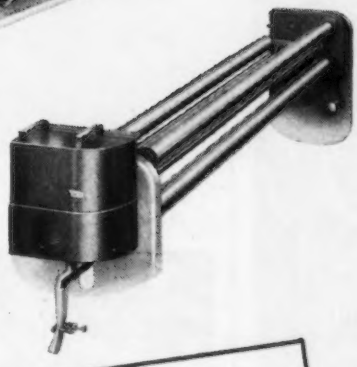
ALL TYPES OF PRINTS WITH PEASE BLUE-PRINTING EQUIPMENT



Pease "22-16" Continuous Blueprinting and Processing Machine has an actual production speed of 20 feet per minute. Pease "22" (not illustrated) has a speed of 30 feet per minute.



Pease "700" Continuous Whiteprint (Dry Direct Process) Developing Machine only.



Pease "K" Continuous Wet Direct Process Developing Attachment for complete Continuous Blueprinting and Processing Machines.

PEASE Continuous Blueprinting and Processing Machines can easily be adapted to meet any printmaking requirements. Using a Pease "22-16" Continuous Blueprinting Machine as basic equipment, you can have a complete printmaking department capable of producing any kind of tracing reproductions by simply using the Pease "700" Multazo Whiteprint (Dry Direct Process) Developing Machine in conjunction with the printer only, or by adding the Pease "K" Continuous Wet Direct Process Developing Attachment to the equipment.

PEASE "22-16" Continuous Blueprinting and Processing Machine is fast, economical and easy to operate . . . makes sharp, clear, contrasty Blueprints, Blueline Prints, Brownprints (Negatives) and Brownline Prints.

PEASE "700" Continuous Multazo Whiteprint (Dry Direct Process) Developing Machine is a table model developer. Prints can be easily and quickly developed on it, after exposure on the Pease "22" Printer or any other printer.

PEASE "K" Continuous Wet Direct Process Developing Attachment, consisting of a developer tank, tray and rolls, is bolted directly to the printer to make Wet Direct Process Prints. The prints are dried and delivered in the same manner as blueprints.

PEASE SENSITIZED PAPERS, made of carefully selected No. 1 paper stock uniformly coated, assure you of sharp line Blueprints, Blueline Prints, Brownprints (Negatives), Brownline Prints and Multazo Whiteprints (Dry Direct Process). For your protection, every roll is wrapped in moisture-proof and light-proof jacket with rip-cord.

Write for Literature and Prices . . .
No obligation, of course.

SPECIAL FEATURES FOUND ONLY ON PEASE BLUEPRINTING MACHINES

Sliding "Vacuum-like" Contact smooths tracings, prevents errors in printing • **Three Speed Lamp Control** provides operation at 10, 15, or 20 amperes, minimizes running speed and drier heat changes • **Actinic "No-Break" Arc Lamps** burn 45 minutes without breaking arc, resume instantaneously • **Horizontal "Floating" Water Wash** floats prints free from tension, prevents wrinkles, stains, bleeding • **Quick Change Chemical Applicator System** economically allows change from Blueprints to Negatives in 30 seconds • **Eight-inch Diameter Drying Drums,** thermostatically controlled, heated by gas or electricity, dry prints "flat as hung wallpaper."

THE C. F. PEASE COMPANY

2695 WEST IRVING PARK ROAD • CHICAGO 18, ILLINOIS

Pease Blueprinting Machines for all kinds of Tracing Reproductions

FORD TRIBLOCS

have his QUALITIES, too

FORD TRIBLOCS have the same two qualities as a powerful horse—strength and speed.

When high-speed production counts—**FORD TRIBLOCS** are ideal for constant hard usage. Spur gear construction, ball-bearing load wheels, both high tensile strength and elasticity in load chain, and many other features assure enduring efficiency. Capacities: ¼ to 40 tons.

FORD SCREW GEAR HOISTS are used where smoothness in lifting and lowering of loads is desirable and where portability is essential. Lightweight; highly portable. Capacities: ½ to 10 tons.

FORD DIFFERENTIAL HOISTS are constructed for light service where speed, portability and price count. Capacities: ¼ to 2 tons.

FORD HOISTS are manufactured by the Ford Chain Block Division of American Chain & Cable, Bridgeport. Offices at Philadelphia, Chicago, Denver, Los Angeles, Portland, San Francisco.

ACCO

Order from Your Distributor

AMERICAN CHAIN & CABLE COMPANY, INC.

BRIDGEPORT • CONNECTICUT

$261,000,000 Surplus War Materiel Disposal By Army

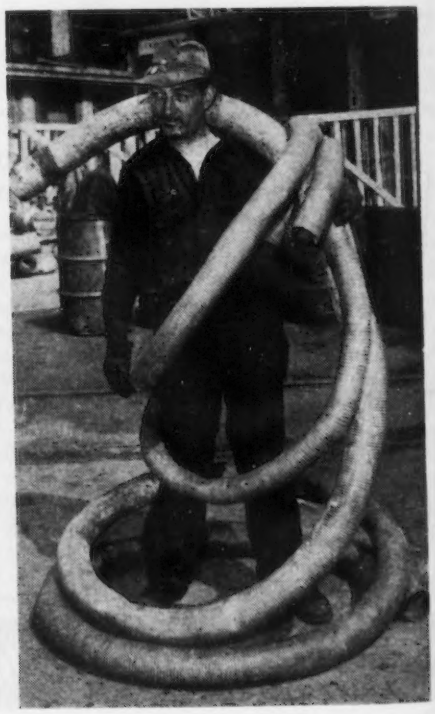
Washington

• • • **Maj. Gen. Lucius D. Clay**, director of materiel, Army Service Forces, recently told the House Military Affairs Committee that the War Department has disposed of approximately $261,000,000 worth of surplus property in the last nine months.

The size of termination inventories awaiting disposition is now $269,000,000 in value, the ASF officer estimated. Prices received for termination inventories have been unbelievably high, ranging from 80 per cent to 100 per cent of cost, General Clay disclosed.

Col. G. I. Back revealed to the committee why the Signal Corps expects to junk more than $800,000 worth of radar equipment at Lexington, Ky. He said the radar parts have been rendered obsolete by further development and research, and that the parts would be sold in mutilated condition because to do otherwise would prove helpful to the enemy. The committee had requested reasons for the proposed Lexington sale, and the sale of similar equipment valued at more than $480,000 at Dayton, Ohio.

SHIPYARD AIRLINE: *Paul Ilovichny, of U. S. Steel's Federal shipyard at Kearny, N. J., coils 60 ft. python hose for use in a temporary ventilation system of a troopship. Where air is thick, in both ships and shops, fresh air is piped to workers as a safety measure. Exhaust fans attached to hose supply the air.*



Assuring *Free and Easy* traverse for a TANK TURRET

Accurate finishing in a fully equipped and highly modern machine shop (a good example of its facilities is the 20′ vertical boring mill above) is only one of the advantages PSF offers to users of steel castings. Back of that is long experience and advanced technique in everything from melting to heat treating, and the ability to handle any size or shape in carbon, alloy or armor steel. Let us work with you on your plans.

WAD 9382

46 YEARS OF STEEL CASTING KNOWLEDGE

Pittsburgh

STEEL FOUNDRY CORPORATION

GLASSPORT, PA.

Sales Offices: NEW YORK • PHILADELPHIA • WASHINGTON AND CHICAGO

Picture yourself helplessly watching vicious flames leap through doorways and windows of your own plant, engulfing valuable machinery and materials. Even worse, picture yourself thinking, "All this *might* have been prevented"—prevented by the installation of Kinnear "Akbar" Steel Rolling Fire Doors. These efficient doors remain coiled overhead out of the way until fire starts—then they close quickly, automatically and safely. By cutting off drafts and blocking the spread of flames, they confine fire to smaller areas, overcoming one of the most outstanding causes of heavy fire loss. Kinnear "Akbar" Rolling Fire Doors, approved by Underwriters' Laboratories, have saved as much as 33% of their cost annually in reduced insurance rates! A safety device controls their downward motion, protects persons passing underneath. Emergency opening after automatic closure is simple; there is no possibility of being trapped on either side. Kinnear Rolling Fire Doors are built any size for any opening—can also be equipped for regular daily service, with either motor or manual control. Eliminate the possibility of fire ravaging your plant because of lack of proper protection at doorways, windows and corridors. Write for complete details on Kinnear "Akbar" Steel Rolling Fire Doors today. The Kinnear Manufacturing Co., 1760-80 Fields Ave., Columbus 16, Ohio.

SAVING WAYS IN DOORWAYS

KINNEAR ROLLING DOORS

Heavy Postwar Rail Passenger Travel Expected by Budd

Pittsburgh

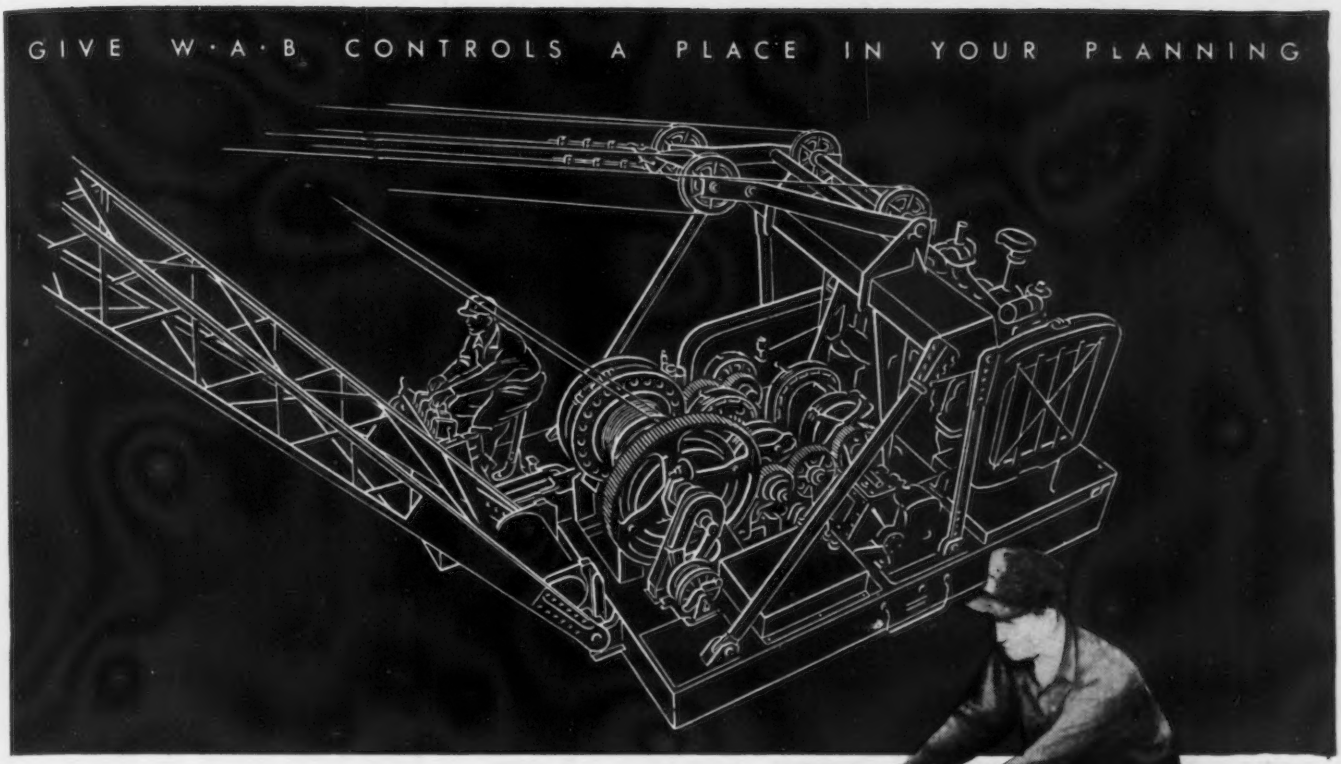
• • • **The volume** of today's railway passenger travel can be multiplied many times in the near future if the railroads provide the kind of service the public will patronize. This is the belief of Edward G. Budd, founder-president of the Edward G. Budd Mfg. Co., Philadelphia, as expressed before members of the Railway Club of Pittsburgh at the Fort Pitt Hotel.

E. G. Budd

Pointing out that the majority of present day passenger coaches were based on designs 44 years old, Budd emphasized the need for a reaffirmation of faith in the irrepressible urge in the average American for travel. He pointed to a 10-year record established by lightweight, streamlined trains as proof that travel can be merchandised if offered in an attractive package.

"The introduction of the modern type of streamline train between Chicago and Minneapolis has resulted in what seems almost an unlimited volume of business where before the business was dwindling," Budd said. "It is true that two railroads are running these trains daily from New York to Miami and carrying out of New York about 1000 passengers every day. Before these trains were started, there was no fast train service in the Summer to Florida because everybody thought there was no business since nobody desired to go to Florida in the Summer. What other such trains have done is common knowledge to all railroad men. The same result can be had between New York, Philadelphia and Pittsburgh, Budd predicted.

"I am one of those who foresee an opportunity not only to hold the present volume of passenger business, but actually to increase it," Budd said. Railroads have improved facilities and now with the new notions as to types of motive power and types of cars, Mr. Budd expressed wonder at how much travel volume could be multi-



Easy on the Operator . . . and Easy on *Equipment*, too . . . *with* W·A·B *controls*

The drawing above "takes the lid off" to let you see the complex mechanism that must be handled in a traveling crane . . . and the picture at right shows how W·A·B Controls help to solve the problem.

All friction clutches on this crane are governed with air. W·A·B pressure-adjusting valves control the clutches on both main drums, on the slewing drive, and on the travel, permitting smooth, easy engagement, that eliminates harmful shocks. Forward and backward travel are initiated by the forward or backward movement of the proper handle. Since a finger-touch is all that is necessary to move the valves, operator fatigue is lessened.

In your post-war planning, investigate the advantages of W·A·B Control Systems for improving your products, and your shop production. A whole series or cycle of operation can be controlled by movement of a single handle, interlocks prevent mistakes, and the force delivered can be anything from ounces to a ton. W·A·B Controls are now serving in dozens of applications . . . and they can undoubtedly do a job for you.

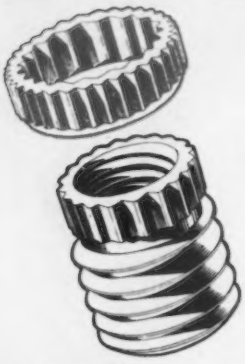
Westinghouse Air Brake Company
INDUSTRIAL DIVISION
General Offices: Wilmerding, Pa.
75 Years of Pneumatic Control Experience

W·A·B

Pneumatic . . . Pneumatic-Electric . . . Pneumatic-Hydraulic

remote control systems

SOLUTION



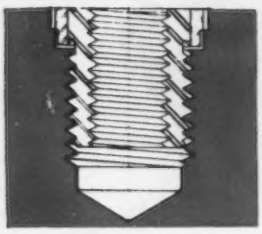
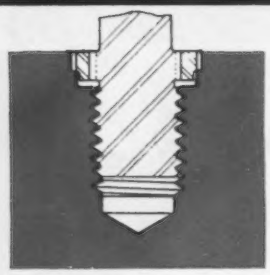
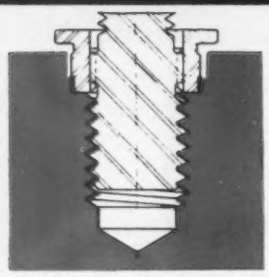
THE ROSÁN STANDARD LOCKED-IN INSERT

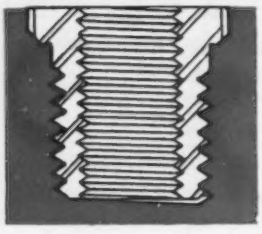
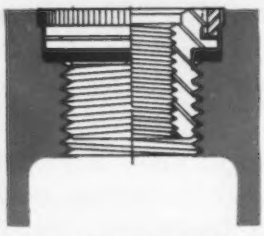
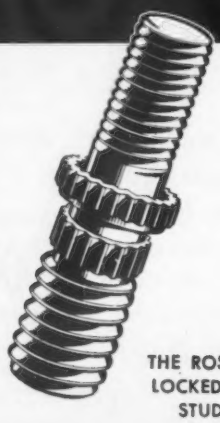
to fastening and sealing problems

The Rosán Locking System solves the problem of locking a threaded insert or a stud in a hard or soft material. The insert is locked in so that it cannot turn or loosen. The stud is also locked in so that it will not back out under any amount of vibration or applied torque. Rosán fastening and sealing units are permanent installations. Both types of units are removable and replaceable without disturbing the parent material.

ROSÁN

U. S. and Foreign Pats. Pend.

STANDARD INSERT	STANDARD STUD	TERMINAL STUD
		
The Standard Insert owes its permanence of installation to the Rosán Locking Ring. This ring broaches the parent material with the sharp leading edges of its outer serrations or splines.	The Locked-in Stud owes its permanence of installation to a locking ring identical with that used on our threaded inserts. Any amount of torque may be applied without disturbing this stud.	The Terminal Stud may be put in from the front; requires no through-boring, recessing or shielding at the back. It is easily removable without disturbing the panel.

REPLACEABLE MOLDED-IN INSERT	HYDRAULIC SEAL	
		
The Replaceable Molded-in Insert is used for plastics and other molded materials. Removal leaves a threaded, counterbored and serrated hole into which our Standard Insert may be installed.	On the Hydraulic Seal Insert, straight external threads are sealed with an AN#902 synthetic rubber ring. Internal threads with a standard *"AND"* type seal tested up to 10,000 lbs. per square inch.	THE ROSÁN LOCKED-IN STUD

WRITE TODAY for free literature. Manufacturers are invited to submit their fastening problems to our Engineering Department. No obligation.

A PRODUCT OF

BARDWELL & McALISTER, INC.

DEPT. T4-64 BOX 1310, HOLLYWOOD 28, CALIF.

plied. "Could we count on 10 coach trains a day running between New York, Philadelphia and Pittsburgh each way? All long trains and all loaded?" he asked. Mr. Budd pointed to the time when the hourly train was first started between Philadelphia and New York. Now these hourly trains are running 10 or 12 cars long, are crowded beyond capacity, and are entirely additional to the many through trains.

Mr. Budd said there should be an hourly train between New York and Boston, and predicted a great network of additional trains through Ohio, Indiana, Illinois and Michigan. "Of course, cost is a factor," he said, "but you don't need to be afraid of the competition. No airplane, automobile or bus can ever carry passengers for as low a fare as can the railroads. The highways will have their share of business but it will have to be at a cost above that of the railroads.

Railroad-operating people and equipment builders have reason for unbounded faith in the opportunities for multiplying railroad passenger traffic many times in the near future by furnishing attractive service and equipment," Mr. Budd concluded.

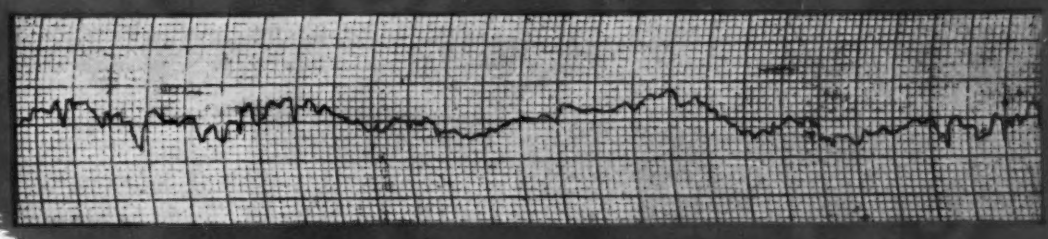
Canmakers To Get Tinplate For Heavy 1944 Food Pack

Washington

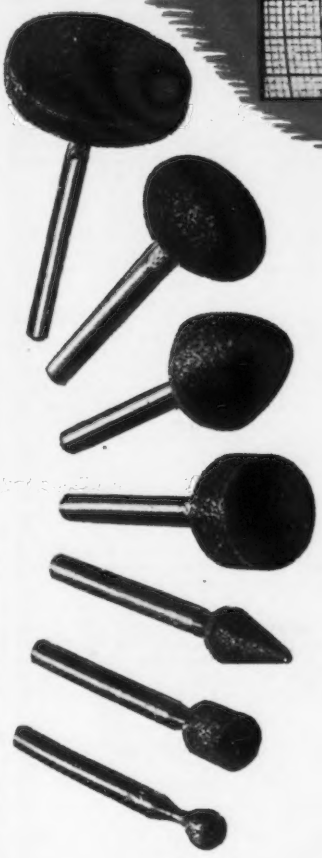
• • • **Given assurance by** the Can Manufacturers' Industry Advisory Committee of the industry's voluntary cooperation, WPB has decided not to issue a proposed directive to Can Conservation Order M-81, which contemplated the prohibition of can making for specified non-essential items during the peak period of demand for seasonal food cans. Can manufacturers had asked for 800,000 tons of tinplate during the third quarter but were allocated only 634,000 tons because of the extreme military demand for rolling capacity. The committee expressed belief in the success of essential can production by voluntary adjustments.

The pack of seasonal fruits and vegetables, which promises to be the largest in history is expected to be supplied on time with the requisite number of cans, IAC members said. They recognized, however, WPB said, that there may be occasional delays in the delivery of cans for non-seasonal products during the weeks when seasonal food demand is greatest.

Proof of a Better Finish



Each small square represents 1.0 micro inches. Micro inch r.m.s. = 0.9 — 1.6.



Surface Analyzer Tape Proves You Get a Better Finish with Chicago Wheels

These results were obtained at a rate of 10 pieces per hour in an aircraft parts plant. Material, X-13-15, Rockwell 60 to 57, grinds out .006 to .007 stock. Chicago Wheel used, 1/2 x 1/2 x 1/8", Grain 180, Grade L Arcite FV Bond. Spindle Speed 40,000 r.p.m. Lapping and super finishing eliminated on this job.

Can you match that finish? Sounds phenomenal, but you can do it with Chicago Wheels. And, the secret of their superiority lies in the new FV Bond, developed exclusively for Chicago Wheels, after 50 years' experience making wheels for the most accurate and precise applications.

Here's What FV Bond Will Do for You

*Reduce your wheel costs

*Produce a better finish without sacrifice of production time—a finish so smooth that you can measure it in micro inches.

TRIAL WHEEL FREE

Write or send the coupon today for a Chicago Wheel, made with this remarkable new FV Bond. Tell us grinder you use, size wheel and kind of material on which you will make your test.

For the duration, with full WPB approval, we are specializing on small sizes—anything up to 3" in diameter.

Write for Catalog and one of the new Engineering Survey Forms, a step in the direction of better finishing.

Half a Century of Specialization has Established our Reputation as the Small Wheel People of the Industry.

MOUNTED WHEELS — SMALL GRINDING WHEELS

CHICAGO WHEEL & MFG. CO.

America's Headquarters for Mounted Wheels and Small Grinding Wheels

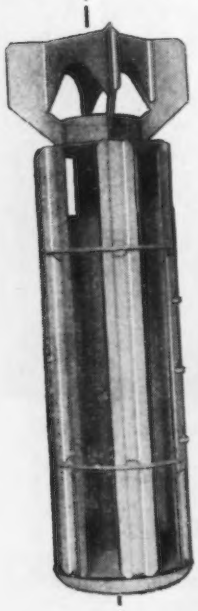
1101 W. Monroe St., Dept. RA, Chicago 7, Ill.

RA-6

Send Catalog and Survey Form. Interested in
( ) Mounted Wheels. ( ) Grinding Wheels.
( ) Send Test Wheel. Size _____

Name _____

Address _____



CLUSTER OF

WARTIME INGENUITY

WITH POSTWAR AIMS

"PACKAGED METAL ENGINEERING"*

can give YOUR *postwar product*

- LOWERED PRODUCTION, ASSEMBLING AND MATERIAL COSTS
- CONTROLLED PRECISION FABRICATION
- IMPROVED UTILITY AND APPEARANCE

THE AIMABLE BOMB CLUSTER is a package of firebrands—110 magnesium sticks that spread fire and havoc. It comprises 59 individual pieces that have been stamped, machined, coined, projection welded (4 sets of 6 welds in rapid sequence), and assembled into a group of 9 main units.

This wartime package of Grammes "Packaged Metal Engineering" is a masterpiece of controlled precision fabrication, synchronized mass production processes, and cleverly devised methods of conveyor assembling—a package of manufacturing ingenuities aimed at benefiting postwar products.

Grammes Contract Service can be your *complete* manufacturing source, providing the all-inclusive services and facilities of "Packaged Metal Engineering"—**in one package . . . in one service . . . we take over* ALL *responsibility, acting as* YOUR *factory, from Design Research to Drop Shipments.* Grammes specialized Metal Working Engineers with more than 69 years of metal fabrication "know-how" plus mass-production facilities can save you time, money, labor, and materials on your product.

The production facilities listed, all-under-one-roof, provide a complete, versatile, and economical set-up for fabricating and assembling metal parts into complete products with precision control.

Though 100% in war work, our Research, Design, and Engineering services are available NOW for idea development and product improvement. Let our *sales-minded* executives work with you in complete confidence.

Send for the informative story of "Contract Service by Grammes"—address Dept. 4-6.

- STAMPING
- DRAWING
- SPINNING
- WIRE FORMING
- ETCHING
- LITHOGRAPHING
- EMBOSSING
- HARD ENAMELING
- SCREW MACHINES
- DRILLING
- WELDING
- MACHINING
- SPRAYING
- HEAT TREATING
- PLATING
- ENAMELING
- TOOLS & DIES
- LINE ASSEMBLY

DECORATED METAL PRODUCTS SPECIALISTS—applying artistic designs and finishes that add beauty and color to your product.

"MASTER CRAFTSMEN IN METAL"

Grammes

L. F. GRAMMES & SONS, INC., ALLENTOWN, PA.

ESTABLISHED 1875

NEW YORK CHICAGO DETROIT CLEVELAND MILWAUKEE PHILADELPHIA

Among the Week's Trade Notes

Bristol Co., Waterbury 91, Conn., has opened a branch office in Houston, Tex. The office is located in the Citizens State Bank Building and will serve the states of Louisiana and Texas. D. D. Ault is in charge.

Osgood Co., Marion, Ohio, has appointed the Acme Equipment Co., Detroit, direct factory representative for its line of shovels, cranes, draglines and Mobilcranes.

The Dallas Division of Revere Copper & Brass, Inc., has opened a district sales office at 1225 Circle Tower, Indianapolis. P. H. Anderson is district manager, and items handled by the office include brass and copper mill goods and manufactured products.

Pheoll Mfg. Co., Chicago, has been appointed prime licensee by North American Aviation, Inc., for the manufacture of the new Hi-Shear rivets developed by that company.

Detrex Corp., Detroit, has enlarged two Eastern sales and service offices and added another in the Midwest. New York headquarters are now located in Suite 4113, Empire State Building, and the Philadelphia branch office has been moved to 12 South 12 Street. The new office was opened at 11 South Meridian Street, Indianapolis, with C. M. Munns in charge.

Abrasive Co.'s Los Angeles distributor, Almquist Brothers & Viets, has added a new abrasive warehouse to its facilities. The building is stocked with a complete line of grinding wheels, mounted points, abrasive cloth, abrasive belts and coated abrasives.

Package Machinery Co., Springfield, Mass., has signed an agreement with the Phin Sales Co., Toronto, whereby the Phin firm will become exclusive Canadian manufacturers of standard wrapping machines of Package design.

Hill Acme Co., Cleveland, has appointed the John E. Livingstone Co., Detroit, exclusive agents of Acme forging, threading and tapping machinery.

Pittsburgh Plate Glass Co., Columbia Chemical Division, Barberton, Ohio, has selected the trade name Allymer for the complete line of Allyl Resin Monomers formerly known as Columbia Resins.

Continental Can Co., New York, has acquired the Reynolds Molded Plastics Division of Reynolds Spring Co., thereby supplying Continental with complete facilities for the production of all forms of molded plastics.

Youngstown Foundry & Machine Co. will greatly expand its electric-welded tubular products department under the direction of H. G. Blevins, inventor and authority on electric tube welding.

Worthington Pump & Machinery Corp., Harrison, N. J., has announced the purchase of Electric Machinery Mfg. Co., Minneapolis. The company will operate independently of the other Worthington activities, and personnel remains the same.

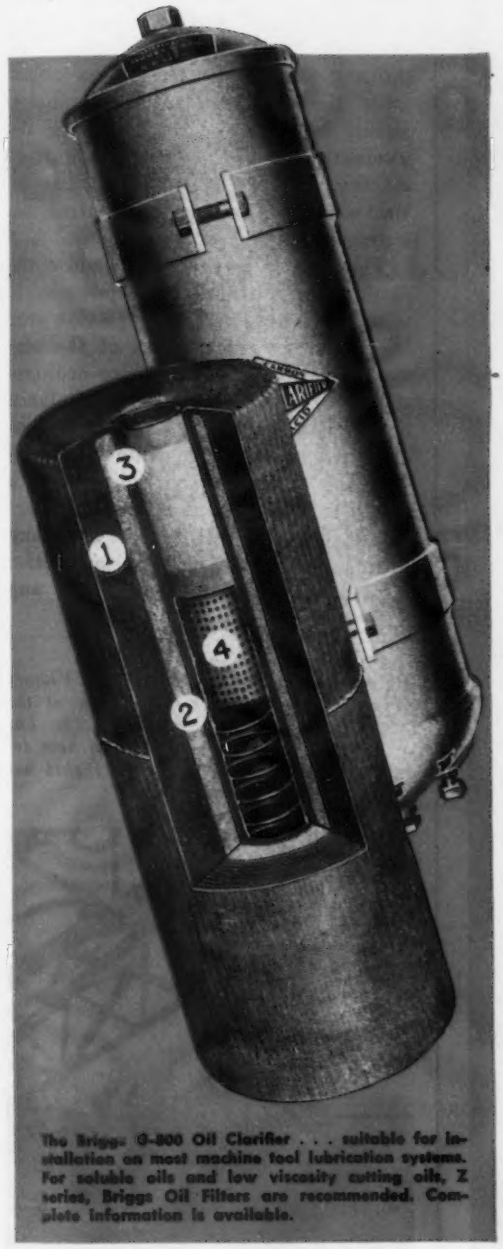
Baldwin Locomotive Works, Philadelphia, has opened a new office at 2405 Terminal Tower, Cleveland, to handle sales for Baldwin divisions and subsidiaries in Ohio, eastern Michigan, and the Pittsburgh district. The office is headed by C. L. Mattsson and J. D. Loftis.

Acme Equipment Co., Detroit, announces that it now represents the General Excavator Co., Marion, Ohio, in Detroit and surrounding territory.

Western Electric Co., Inc., New York, has taken a three-year lease on 290,000 sq. ft. of industrial property in downtown St. Paul to be used in the manufacture of telephone sets. Delivery of the sets is expected to begin in the late fall.

BRIGGS OIL CLARIFIERS

Maintain LUBRICATING HYDRAULIC AND CUTTING OILS



The Briggs G-800 Oil Clarifier . . . suitable for installation on most machine tool lubrication systems. For soluble oils and low viscosity cutting oils, Z series, Briggs Oil Filters are recommended. Complete information is available.

PHYSICALLY CLEAN

Free of all dust, grit and other visible abrasive impurities . . . by ABsorption through specially-treated long fibred cellulose.

CHEMICALLY PURE

Free of all the products of oxidation . . . gums, resins, acids, asphaltenes . . . that cause formation of damaging corrosive sludge . . . by ADsorption through the Patented Molded Fullers Earth Block.

VISIBLY CLEAN

Final filtration through cellulose removes particles as small as 7 microns, (.0003"). Oil looks and IS "refinery-pure" after filtration through a Briggs Oil Clarifier.

Only a Briggs Oil Clarifier gives you this 3-way protection. No complicated servicing is necessary . . . cartridge replacement is a matter of minutes. No parts to wear out or break. There is a Briggs Oil Clarifier designed and manufactured to provide the answer to every oil filtering problem. See the Briggs distributor in your locality and get his expert recommendation.

WHY A BRIGGS DOES MORE THAN AN ORDINARY OIL FILTER

The BIG advantage of Briggs Oil Clarifiers is the Patented Fullers Earth Block (2) . . . recognized by refiners as the ideal filtering medium. This feature in addition to layers of cellulose (1 and 3) is why a Briggs Oil Clarifier maintains oil in a "refinery-pure" state . . . physically, chemically and visibly.

Other advantages—Scientifically designed for minimum pressure drop . . . operates on low pressure or gravity feed. Small size—only 23-3/4" high, 6-1/16" diameter. Furnished with mounting brackets. Complete range of size and models available . . . permits PROPER capacity installation.

ARMY (E) NAVY

Briggs

PIONEERS IN MODERN OIL FILTRATION

BRIGGS CLARIFIER COMPANY

1339 WISCONSIN AVENUE, N.W. • WASHINGTON 7, D. C.

Representatives in Principal Cities

CONTINUOUS BILLET HEATING

Oil fired, with hydraulic pusher and automatic temperature and pressure control, this R-S Continuous Billet Heating Furnace is highly satisfactory from every viewpoint. It reveals the degree of thoroughness of R-S Engineers which, after all, is the basis of every successful furnace installation.

You can depend on R-S custom-built or standard-rated furnaces of any size or type—all are engineered with the idea of "not how many but how well." Surprisingly fast deliveries, too.

FURNACE DIVISION
R-S PRODUCTS CORPORATION
4524 Germantown Avenue
Philadelphia, Pa.

**Write for the R-S Car-Hearth Bulletin No. 68-F or information on any type of furnace in which you are interested.*

R-S Furnaces of Distinction

ANNEALING CONVEYOR
CONVECTION FORGING METAL MELTING
ROTARY HEARTH CONTINUOUS CAR HEARTH
SALT BATH PLATE AND ANGLE HEATING

BUY WAR BONDS

British Steel Plan

(CONTINUED FROM PAGE 108)

the act. Under the act an arbitration tribunal would be set up to determine the amount of fair compensation to be paid to the private firms whose properties are taken over. The board itself would consist of about 10 members appointed by the president of the Board of Trade on the ground of their competence to conduct the industry's affairs. The union stipulates that workers in the industry should be consulted through their organization, on the appointment of members of the corporation, and on the sectional boards of control required under the scheme.

The union proposes to endow the corporation with extensive powers. It is to exercise general supervision over the activities and policies of the sectional boards, and should co-ordinate their work in order to keep a balance between the different sections of production. Its function would be to adjust the policy of the industry as a whole to the general economic policy of the government; to carry on any business ancillary to the production of iron and steel; to acquire any

READY FOR SERVICE: *New Victory ships line the outfitting docks at the California Shipbuilding Corp., in Los Angeles. These vessels are of new design, as older type of Liberty ship has been discarded.*

Contact **KAYDON** *of Muskegon*

For Unusually Large, High Precision Bearings

BALL and ROLLER BEARINGS

Standard and Special

FROM 6" INSIDE DIAMETER TO 100" OUTSIDE DIAMETER
COMMERCIAL FINISH OR ULTRA-PRECISION

Spherical Roller Bearings
Radial Ball Bearings • Thrust Ball Bearings
Radial Roller Bearings • Thrust Roller Bearings
Taper Roller Bearings

Straight or Self-aligning . Extra Heavy Duty or Special Light Type

LIGHT WEIGHT NON-METALLIC CAGES OR STANDARD BRONZE TYPE

★ *Early Delivery* ★

PRECISION MACHINE WORK OR GRINDING

to unusual accuracy in large diameters

ATMOSPHERE HARDENING • FLAME HARDENING • PRECISION HEAT TREATING
METALLURGICAL LABORATORY • MICROSCOPY AND PHYSICAL TESTING

THE KAYDON ENGINEERING CORP.

For excellence in production of extremely precise, unusually large ball and roller bearings

McCRACKEN STREET • MUSKEGON, MICH.

New in Name . . . Old in Experience

Internal discharge through center of intake eliminates piping.

See Section 5 of New Catalogue.

"NO OUTSIDE PIPING.."

with this type

GUSHER COOLANT PUMP

• • •

Suited for today's high-speed production, Gusher Coolant Pumps help you to meet the most urgent production schedules.

Simple in design, trouble-free, efficient, dependable.

Our line includes immersed types, tank units, flange-mounted types; also plain-shaft and belt-driven types.

Gusher Coolant Pumps are designed to withstand abrasives and grit, need no priming, require no packing, and may be throttled quickly from a gush to a trickle without injury to the pump.

Easily adaptable to changing types of machine production.

From a dribble to 200 g.p.m.—1/10 to 2 H.P.

Write for complete new catalog indexed for quick reference.

Gusher Pumps—Patented and Patents Pending.

THE RUTHMAN MACHINERY CO.

1821 READING ROAD CINCINNATI 2, OHIO

The "Gusher"—A Modern Pump for Modern Machine Tools

patents, trade marks or registrations which are deemed to be desirable; and generally to do everything considered necessary for the efficient operation and adequate development of the industry, including the fixing of production and sales quotas, the allocation of raw materials, the development of sales organization and the agreements with the iron and steel industries of other countries.

Under guidance and control of the board, sectional boards would be established for each of the large divisions of the industry. Each board would be solely responsible for the production of the class of products covered, though each board would naturally also be required to conform to the general plan laid down in regard to the supply of raw materials, allocation of orders, and the marketing of the finished product. The important function of price fixing would be entrusted to the central body, the corporation itself, in conjuction with a body representing the interests of consumers. The final decision in cases of dispute would rest with the Minister.

The union has given thought to the question of the status of the workers and technicians in such a socialized industry. It conceives the functions of the trade unions to be of a two-fold character—firstly in relation to the general conduct of the industry, and secondly as the means of arranging the wages and general terms of employment.

As to the first function the union expects to see a development of workshop organization by which rank and file workers, as well as managerial and technical staffs would be consulted on questions concerning workshop practice and discipline, safety and health conditions, and similar matters. It is suggested that the Work's Councils should have the right to nominate, from their members, representatives with the necessary capacity and experience to serve on the sectional boards.

As to the determination of wages and conditions of employment, the union bases its hopes upon a development of the present method of collective bargaining. The essence of the bargain, the union insists, is receiving security, in return for contributing honest service. This may mean changes in the wage system, involving a new spirit of partnership among all engaged in the industry. A socialized industry such as the union wished to bring into existence must maintain itself and must give real and efficient service.

with

Wickman

SWISS TYPE AUTOMATICS

and their various attachments

In addition to normal turning and forming operations

The No. 2 Wickman machine illustrated is equipped with both three-spindle and slotting attachments. Three other attachments for drilling, threading and taper turning are also supplied for this machine. All Wickman attachments are easily interchangeable.

Do you manufacture parts which are in any way similar to those illustrated above—which require any of the operations listed? Are you interested in holding production runs of those parts to tolerances of ± .0005" or closer and securing finishes as fine as 25 micro-inches? If your answers to these two questions are in the affirmative, Wickman Swiss Type Automatics have a place in your production.

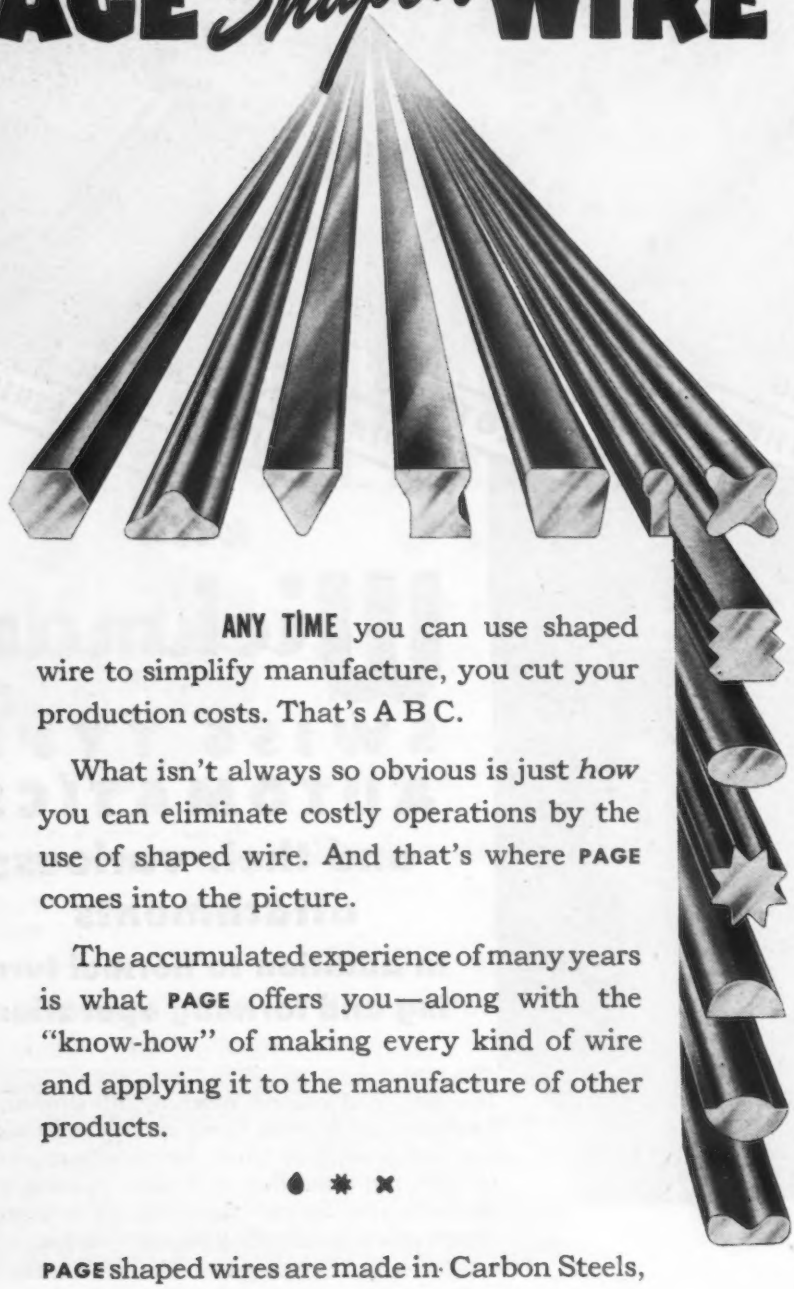
Two Swiss Type Automatics are produced by Wickman. The No. 2 machine shown above has a ½" bar capacity and will handle pieces up to 4" long. The No. 1 machine has 5/32" bar capacity, maximum length capacity of 1 9/16".

LET US SEND YOU FULL INFORMATION

THE Wickman CORPORATION

15537 WOODROW WILSON AVE.
DETROIT 3, MICHIGAN

PAGE *Shaped* WIRE



ANY TIME you can use shaped wire to simplify manufacture, you cut your production costs. That's A B C.

What isn't always so obvious is just *how* you can eliminate costly operations by the use of shaped wire. And that's where **PAGE** comes into the picture.

The accumulated experience of many years is what **PAGE** offers you—along with the "know-how" of making every kind of wire and applying it to the manufacture of other products.

* * *

PAGE shaped wires are made in Carbon Steels, Armco Ingot Iron, Stainless Steels in end-sectional areas up to .250″ square and in widths up to 3/8 inches.

Let **PAGE** help you plan for efficient production.

PAGE STEEL AND WIRE DIVISION

Monessen, Pa., Atlanta, Chicago, Denver, Los Angeles, New York, Pittsburgh, Portland, San Francisco

In Business for Your Safety

AMERICAN CHAIN & CABLE COMPANY, Inc.

BRIDGEPORT • CONNECTICUT

SAE War Materiel Meeting to Discuss Postwar Automobiles

Detroit

• • • **Practical engineering** previews of postwar automobiles will be presented at SAE National War Materiel Meeting, June 5 to 7, at Detroit, as part of a three-day discussion of engineering aspects of war materiel production. The program of the meeting has been described by John A. C. Warner, general manager of SAE, as indicative of the way wartime automotive engineering projects contribute directly to postwar developments.

The purpose of the meeting is to aid the Army and Navy in disseminating engineering information pertinent to production of war materiel and to facilitate engineering discussion of tough wartime production problems. Postwar implications, however, are inescapable. Technical papers on hydraulic transmissions; on adaptation of aircraft production methods, aircraft-type structures, and aircraft engines to ground vehicles; and on chemical surface treatments to improve war materiels and on heat treatment of steel, all contain information which will be helpful to postwar production.

An evening session will be devoted to the postwar automobile, with Brooks Stevens, industrial designer, of Milwaukee, and W. B. Stout, of Consolidated-Vultee Aircraft Corp., Detroit, leading the discussion.

COMING EVENTS

June 12-14 — Annual Convention, American Electroplaters Society, Cleveland.

June 19-22—American Society of Mechanical Engineers, Pittsburgh.

June 26 to 30—Annual Meeting, American Society for Testing Materials, New York.

Oct. 5-7—SAE National aircraft engineering & production meeting, Los Angeles.

Oct. 5-6—AIME Electric furnace steel conference, Pittsburgh.

Oct. 10-11—Gray Iron Founders' Society, Inc., Cincinnati.

Oct. 12-14—The Electrochemical Society, Inc., Buffalo.

Oct. 16-18—AIME Fall meeting, iron and steel division, Cleveland.

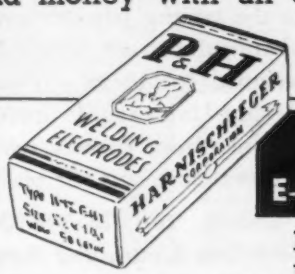
Oct. 16-20—American Society for Metals, Cleveland.

Dec. 4-6—SAE National air cargo meeting, Chicago.

P&H ANNOUNCES IT CAN BE DONE!

AC and DC Welding with the Same Electrodes!

You've waited for this — electrodes that perform equally well on AC or DC! They're ready — not one, but *two* such electrodes — to simplify buying — to save your time and money with an arc that's extremely stable and easily controlled. Thoroughly proved in use and by exhaustive tests, these electrodes are ready to serve you better. Prove them to yourself *now* with a trial order.



AC-1
E-6010 and E-6011

For AC, and either polarity on DC

Tensile strength, 65,000 — 70,000 P. S. I.
Yield, 55,000 — 60,000 P. S. I.
Ductility, (2") — 25% to 35%.
Available in all sizes — 14" and 18" lengths.

Conforms to requirements of:

U. S. Navy Bureau of Ships specifications 46-E-3 Grade 3, Class 1, 2 and 3.
Hartford Steam Boiler and Insurance Company.
American Bureau of Shipping.
Lloyds Register of Shipping.
Full information and procedures on request.

AC-3
E-6012 and E-6013

For AC, and either polarity on DC

Tensile strength, 65,000 — 70,000 P. S. I.
Yield, 55,000 — 60,000 P. S. I.
Ductility, (2") — 18% to 25%.
Available in all sizes — 14" and 18" lengths.

Conforms to requirements of:

Hartford Steam Boiler and Insurance Company.
American Bureau of Shipping.
Lloyds Register of Shipping.
Full information and procedures on request.

60 YEARS OF SERVICE 1884 1944

A COMPLETE ARC WELDING SERVICE

DC WELDERS | AC WELDERS | WELDING POSITIONERS | PRODUCTION CONTROL SYSTEMS

General Offices:
4401 W. National Avenue, Milwaukee 14, Wisconsin

HARNISCHFEGER CORPORATION
WELDING ELECTRODES · MOTORS · HOISTS · P&H · ELECTRIC CRANES · ARC WELDERS · EXCAVATORS

Canadian Distribution: The Canadian Fairbanks-Morse Co., Ltd.

FREE
SERVICE REPORT
on combating bacteria growth
IN
COOLANT
Solutions

Specially prepared to help control or prevent bacteria growth in coolants used in various machining, cutting, grinding and similar operations, a NEW, 4-page Oakite Service Report describes precautionary measures that will be of inestimable value to you.

In combating contamination of these oil-water emulsions, for example, it gives in detail Oakite materials and methods for THOROUGHLY cleaning out main supply tanks, individual tanks on machines, supply lines and pumps as well as successful techniques for subsequent germicidal treatment which has proven unusually effective.

You can also put into practice eleven sanitation suggestions for plant cleanliness and individual hygiene described in the Report. They will help you prevent rancidity of these oil-water emulsions and will be an important aid in minimizing dermatitis infection.

Send for FREE Copy!

If you want to lower costs, increase safety, save time, write for this FREE Report NOW!

OAKITE PRODUCTS, INC.
30H Thames St., New York 6, N. Y.
Technical Service Representatives Located in All Principal Cities of the United States and Canada

OAKITE Buy Bonds for Victory
Specialized cleaning
MATERIALS & METHODS FOR EVERY CLEANING REQUIREMENT

Alabama Dry Dock Co. Farms Out Ship Parts

Mobile

• • • **Because the** Alabama Dry Dock and Shipbuilding Co., Mobile 2, could use many more welders than can be found in this section, it has resorted to jobbing out to small firms pre-fabricated parts limited in size to dimensions which the railroads can handle. By a judicious selection of these parts, they have also been kept within a weight a 10 or 15-ton crane can lift.

By using a fabrication-in-transit rate, steel can be sent from the mills to the small fabricator direct, fabricated, assembled and welded at the subcontractor's plant and then forwarded to the shipyard. Fabricators at considerable distances from Mobile therefore have a chance to get some of this work, according to A. Byron Hunicke, assistant chief engineer, of the shipbuilding division, who states that the system is still being extended.

Besides serving the shipyard's need to get its welding done in spite of the shortage of welders, the plan offers small plants with fabricating and welding facilities an opportunity to participate in this phase of the war effort, beside a chance to keep their welders busy in the communities in which they live. It also keeps such plants going against the day when they are able to resume local peacetime work.

Canadian Shipbuilders Plan Continued Postwar Operations

Toronto

• • • **Plans are underway** whereby the Canadian shipbuilding industry may be placed on a permanent basis. During World War I, shipbuilding rose to record heights for the Dominion, but at the conclusion of hostilities interest in this industry lapsed and only one or two of the larger builders remained in business. At the outbreak of the present war, Canadian builders again stepped to the front and today there are some 18 major shipbuilding companies operating in Canada that have been averaging a ship a day to meet special wartime emergencies.

It is reported that the representatives of these shipbuilding companies are working together under a new agreement with a view to securing work for all after the war, rather than for just one or two of the larger companies.

Where job conditions at your plant call for high speed cutting under constant use, it will pay you to choose a Victor hack saw blade of the "MOLY"* High Speed Steel type. Due to its combination of alloys plus heat treatment, a Victor "MOLY" will carry a heavy work load, retaining sharpness throughout severe service.

Where the sawing jobs are awkward and difficult you can get a blade that's designed for them — if you select a Victor Unbreakable Special Flexible. Then too, correct tooth selection gives more cuts per blade.

There's Choice, too, in VICTOR Power Hack Saw Blades and Metal Cutting Band Saw Blades

For all power hack saw blade jobs there is a correct specification for efficiency. Victor flexible back metal cutting band saw blades, furnished in coils or cut to length, are procurable for any metal cutting job and, for hack saw frames, the new Victor #20 lever-lock, pistol grip is in a class by itself.

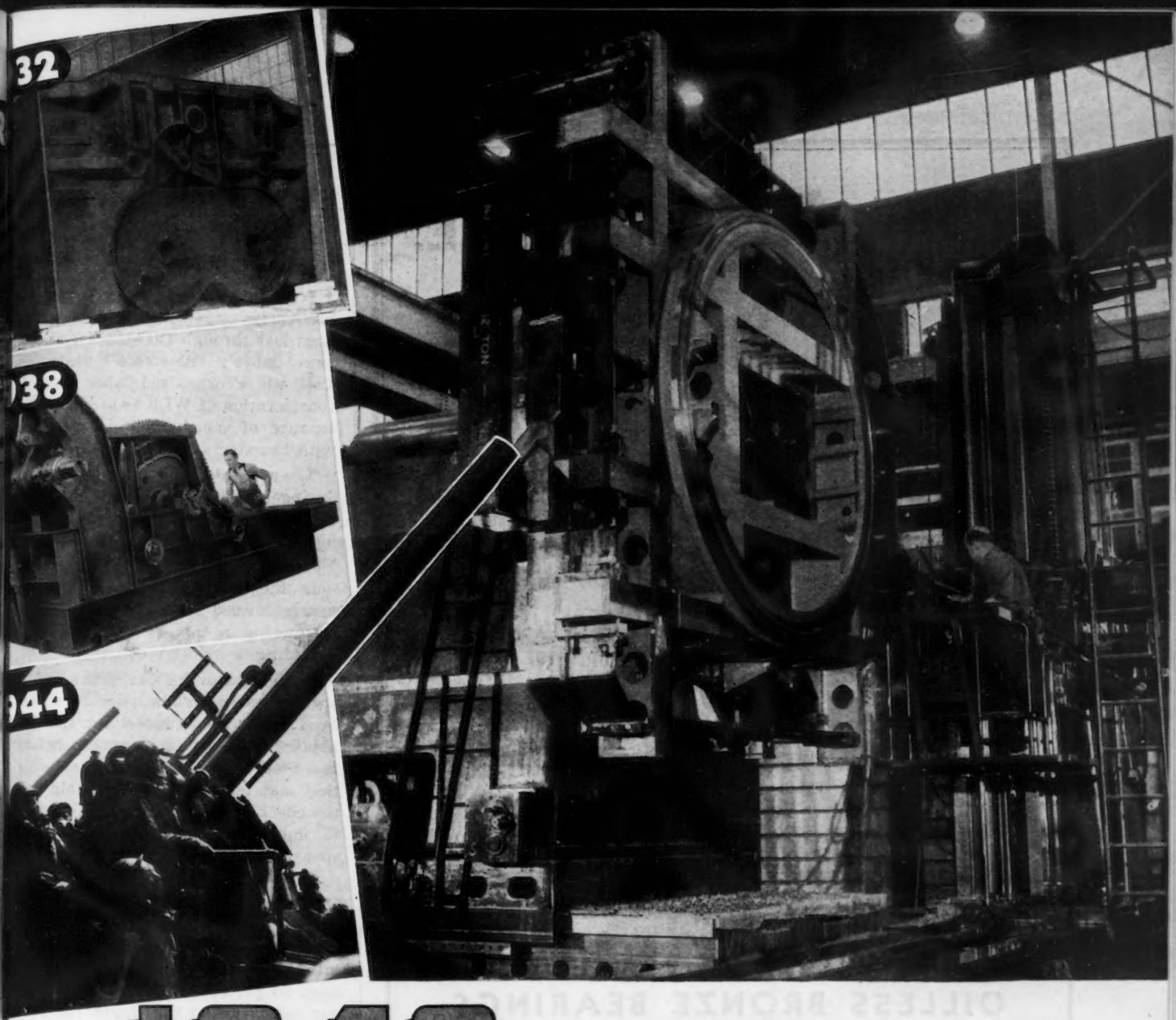
Write for your free copy of Victor's "Metal-Cutting" booklet, a miniature textbook on ways to get the most out of your blades.

VICTOR SAW WORKS, INC.
MIDDLETOWN, N.Y.

*T. M. Reg. — Blades bearing the name "MOLY" are made only by Victor Saw Works, Inc. and affiliated companies.

Makers of hand and power hack saw blades, frames and band saws.

5629



1942 WHATEVER THE DATE

Welding facilities will provide for the production of welded steel structures beyond the scope of most weld shops in size and precision—after the war.

Machine tool facilities will exceed in size and capacity the usual equipment found in the larger tool rooms —after the war.

We will be glad to get in touch with you or your representatives as to the nature and scope of these facilities—at any time.

DANLY MACHINE SPECIALTIES, INC.

2100 SO. 52nd AVE. CHICAGO 50, ILLINOIS

DANLYWELD

Danly Die Sets • Die Makers' Supplies • Welded Steel Fabrication

A.I.S.I. HY-TEN S.A.E.
N.E.

ALLOY STEELS FOR VICTORY

Scientifically selected to conserve critical alloys and meet the requirements of the AIRCRAFT, ORDNANCE, and MACHINE TOOL industries.

Complete "EARMARKED" stocks of Aircraft alloy steels at Buffalo and Detroit.

WHEELOCK, LOVEJOY & CO., INC.
126 Sidney Street Cambridge 39, Mass.
Cleveland 14, Chicago 23, Newark 5, Detroit 3, Buffalo 10, Cincinnati 32

BRONZE BEARINGS
OILLESS BRONZE BEARINGS
GEAR BLANKS
MACHINED BRONZE PARTS

S & H Bronze Bearings can be furnished in any size or quantity to meet your particular requirements.

Our equipment and manufacturing methods enable us to meet the most exacting specifications and design.

INDUSTRIAL BEARINGS

S. & H. Bearing and Manufacturing Co., Inc.
340-344 North Avenue, East
Cranford New Jersey

War Effort Loss By Steel Strikes Analyzed

Washington

• • • **Enough steel** to make 15 big battleships or 2100 heavy bombers has been lost through CIO-USWA strikes since labor's "no-strike" pledge in 1941 which organized labor gave in consideration of WLB awarding maintenance of membership in contracts with the steel industry.

The actual loss, about 1,500,000 tons during 1942-1943 and up to March 29 of this year, was caused by approximately 1342 strikes and involved about 221,969 workers.

In the first quarter of this year, nearly 200,000 tons were lost, with a waste of more than 500,000 manhours, according to industry estimates.

These figures for the entire industry are based on statistics furnished by T. F. Patton, counsel for the Republic Steel Corp. in argument before the Steel Panel on June 2, showing that maintenance of membership and the check-off ought not to be granted to unions with demonstrated "irresponsibility."

In regard to the number of work stoppages and strikes, workers involved, and manhours lost since the "no-strike" pledge the following table introduced by Mr. Patton is based upon 70 per cent of the country's ingot capacity and the figure for production loss was obtained from companies representing 68.4 per cent of ingot capacity.

Number of work-stoppages and strikes	940
Number of employees involved	155,378
Total production lost, tons	964,284
Total manhours lost	2,612,993

Mr. Patton tore apart the union demand for the check-off with criticism of the political purposes to which union dues are being put in the forthcoming election.

Referring to the $700,000 earmarked by the Political Action Committee in Philadelphia at the CIO conference, Mr. Patton read from a published report of the conference that leaders said they planned to spend up to $5,000,000 of local and state union funds if necessary to put United States labor squarely in politics.

"The result will be to place potential financial backing behind some political party, based on forced contributions to a previously unheard of extent," Mr. Patton continued. "This

is contrary to the public interest and the fundamental institutions of a democracy which functions only through the will, freely expressed by a majority of its citizens."

Holland's Steelmaking Equipment Used In Goering Steel Works

New York

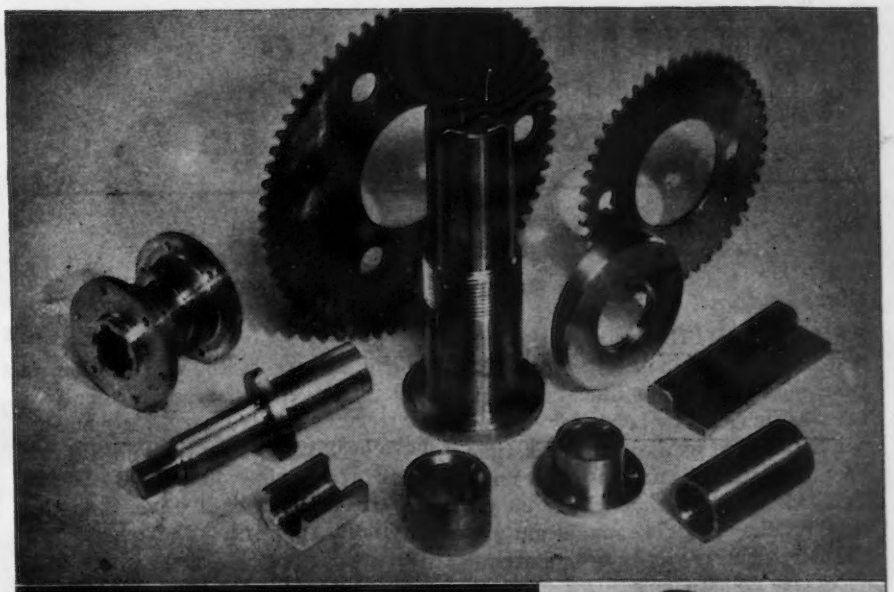
• • • **Conceived during** World War I, Holland's steel industry was killed off in World War II. The obituary was in the form of a German statement that the blast furnaces and rolling mill in the town of Velzen on the North Sea canal which links Amsterdam with the sea had been dismantled and carried off to Germany.

The haul included 5000 electric motors, 5000 rollers, miles of cable and four traveling cranes, all of which was "acquired" by the Hermann Goering Works. The Germans explained this transfer as a "protective measure against destruction by the invading allied armies."

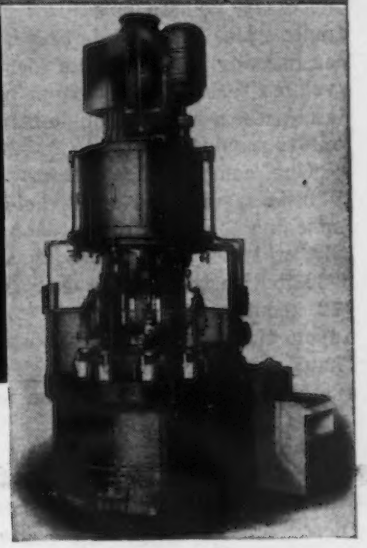
This mill, considered one of the finest in Europe was fathered by a Committee for the Foundation of a Blast Furnace Steelworks and Rolling Mill establishment, which was organized in 1917. Difficulties encountered during the first war in obtaining raw materials and half-finished products for Holland's well-established metal industry made the government very receptive to the committee's plan. And within two months a bill was placed before Parliament proposing to authorize the Minister of Finance to participate for an amount of 7,500,000 guilders (guilder equals $0.54) in the capital of 25,000,000 for the establishment of a Dutch blast furnace and steel rolling mill. Authorization was granted the following year and in 1923 Holland's first and only steel mill started operations.

Texas Firm Authorized to Increase Warehouse Space

• • • **A 220 ft. extension** to its warehousing facilities at Houston, Tex., has been authorized for the Earle M. Jorgenson Co., steel distributors. The new warehouse will be equipped with a 5-ton overhead crane and is designed primarily for the storage of cold finished steels. In addition to regular warehouse stocks, Jorgenson carries an earmarked stock of steel for the aircraft industry.



Most leading machine-tool builders protect you against failure at critical points . . .



— with parts of wear-resisting

Ampco Metal

Check for this protection, when you look at the specifications of machines you buy — for you know that the name "Ampco" stands for longer life, several times that of ordinary bronzes. This remarkable alloy of the aluminum bronze class has been adopted by over 90 leading machine-tool makers — where they need exceptional strength, or resistance to wear, shock, and fatigue. Be sure you get it on your new machines — and insist that replacement parts for your older machines be made of durable Ampco. Write for catalog.

MW-2

Ampco Metal Parts in the Bullard Mult-Au-Matic

Bullard machines, built by The Bullard Company of Bridgeport, Connecticut, include over 60 different parts of Ampco Metal — an outstanding indication of the excellence of their product.

Ampco Metal, Inc.
Dept. IA-6 Milwaukee 4, Wis.

Ampco Field Offices in Principal Cities

Reg. U. S. Pat. Off.

AMPCO

Metal

The Metal without an Equal

Ampco Metallurgical Specialties

Ampco Metal . . . Ampcoloy (general industrial bronzes) . . . *Special Copperbase alloys.*

Sand Castings . . . Centrifugal Castings . . . Extruded and other Wrought Products . . . Precision-machined parts. Ampco-Trode (coated aluminum bronze electrodes) . . . Ampco Non-Sparking Safety Tools.

MACHINE TOOLS

. . . News and Market Activities

Data Lacking on New Requirements

Cleveland

• • • **While WPB has** recently estimated that machine tool volume this year may hit $600 million, no accurate estimates of the order volume per month are available at this time. Some reports indicate that orders may lead shipments per month by 20 per cent but the struggle to maintain production volume and pre-determine necessary volume may throw this estimate wide. The truth is that no builder has any very concrete idea of the volume to be expected from his shop and each is having trouble estimating effort required.

One compensating factor is that Russia is reported to be holding off machine tool requirements temporarily, which should reduce by at least $30 million the volume over the next 12 months. This is said to hinge upon the need for ship bottoms to haul more seriously needed material rather than lack of machine tool demand.

The nature of current orders would indicate that a high percentage of the shell tools needed have been ordered but volume has nowhere near approached the $250-million boost in the estimated annual volume. This would further indicate that many tools of other types are planned. One line that is known to be short is for fuze lines. These require a great many costly and complex multiple-spindle automatics that may be slow in delivery.

The balance of the $250 million in orders anticipated for the year is a mystery to the industry. Its members have been warned by the military and WPB that this volume will be required but little data other than this has been supplied. The question in all machine tool builders' minds, consequently is, "What am I expected to build and how many?"

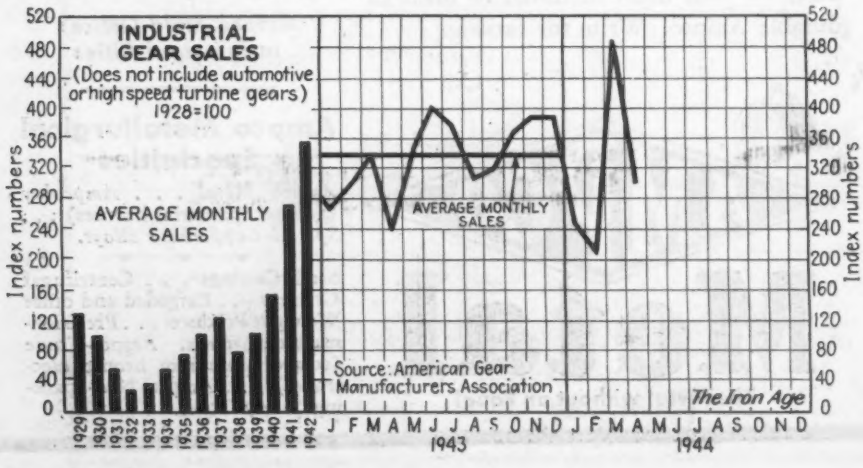
Without the answer to this question builders are in the dark as to how much shop capacity should be reconverted from war subcontracts to tool building, how much labor to try to hold in standby condition to assure production when the larger volume of tools appears and what subcontracting of tool parts should be lined up in readiness. Machine tool builders say the Army has the answer and are somewhat critical of its reticence on details.

One authority in machine tool circles charges that the Army has refused to give tool builders further pool orders because the system was so effective when first used with the machine tool industry that all industries have clamored for the same treatment. Pool orders offer the protection that all industries would like to have under the uncertainties of war production.

Tool builders feel especially deserving of pool order protection since they have borne a heavy brunt of the renegotiation trials so far in this war. They point out that their earnings are for the most part buried in plants and facilities and, that with taxes and renegotiation a surety, they cannot risk much in the way of an additional investment when net return on sales promises to be no more than 3 per cent. The 1942 net return on sales for the industry appears to average about 3.2 per cent.

April Gear Sales Drop Sharply

. . . The gearing industry as represented by the members of the American Gear Manufacturers Association shows a decrease of 37.6 per cent in the business booked in April, as compared with March. The April index figure was 303.


INDUSTRIAL GEAR SALES
(Does not include automotive or high speed turbine gears)
1928=100
AVERAGE MONTHLY SALES
AVERAGE MONTHLY SALES
Index numbers
Index numbers
Source: American Gear Manufacturers Association
The Iron Age
1929 1930 1931 1932 1933 1934 1935 1936 1937 1938 1939 1940 1941 1942
J F M A M J J A S O N D J F M A M J J A S O N D
1943
1944

•

Universal Engineering Gets "Automatic" and Coulter Line

• • • **The** Universal Engineering Corp., Cedar Rapids, Ia., designers and manufacturers of dies, jigs, gages, special taps and cutting tools and special machinery, has acquired the manufacturing rights, parts stocks and current orders for the U-6 "Automatic" and Coulter types of thread milling machines formerly manufactured by the Automatic Machinery Corp. and the Bolton Mfg. Co., both of Bridgeport, Conn. Universal Engineering also manufactures a complete line of ground thread hobs for use with these thread millers.

H. Earl Fries has been appointed manager of the machine tool division of the Universal Engineering Corp.

•

Production Stepped Up To Meet Fresh Demand

Cincinnati

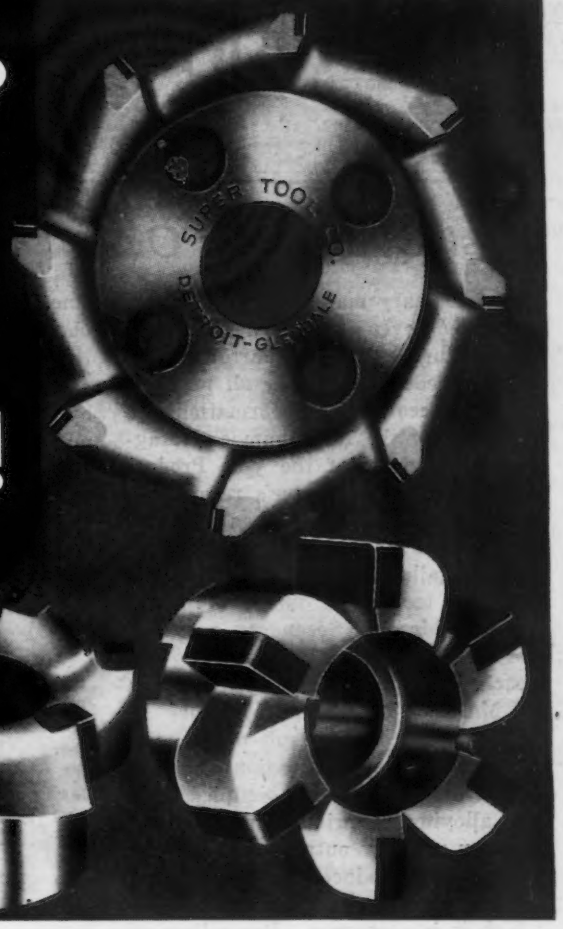
• • • **The steady placing** of more machine tool orders in this district tends to increase the tenseness of the market. Manufacturers who have already received additional orders are stepping up production wherever possible to meet new delivery dates and those still anticipating further business are looking over the schedules to see if further expansion is possible.

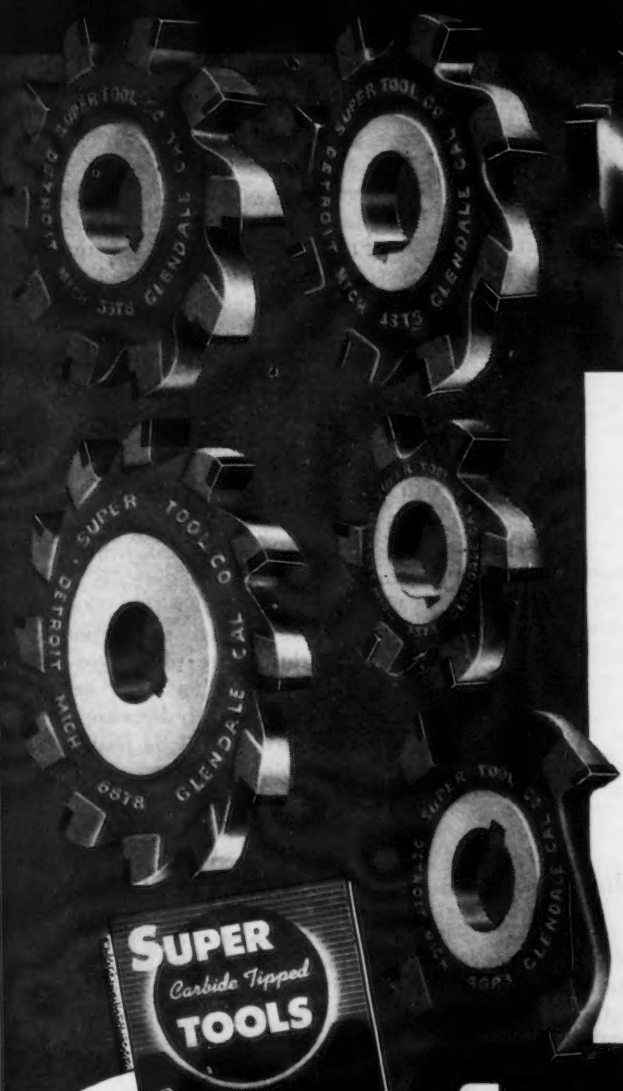
On the heels of this renewed activity in the market, personnel problems have increased, since many manufacturers were in the process of leveling off working forces at the time the new program was announced. It goes without saying, that virtually no skilled workers are available, and even the supply of ordinary labor which heretofore has been trained under learner schedules is down to a pretty low level.

Want Super Milling?

USE

SUPER MILLING CUTTERS!





Plain milling—side milling—face milling—end milling—whatever the types of milling operation you are doing, try a Super Carbide-Tipped Milling Cutter . . . and see what we mean by Super Performance! For in the Super Tool Line you'll find a milling cutter for any of the above types of milling operation—one that will bring faster cutting, cleaner cutting, finer finishes, greater accuracy and longer cutter life to that milling job.

Super Carbide-Tipped Milling Cutters are made in the complete range of standard sizes. That's another reason why they are MONEY SAVERS! Super Tool Milling Cutter Economy starts with the first cost and continues on through every operation in the cutter's long life.

Try Super Carbide-Tipped Milling Cutters TODAY, and you'll agree . . . For Super Milling use Super Milling Cutters!

Write for a free copy of this new general catalogue just off the press.

SUPER TOOL COMPANY

Carbide Tipped Tools

21650 Hoover Rd., Detroit 13, Mich. 4105 San Fernando Rd., Glendale 4, Cal.

NON-FERROUS METALS

. . . News and Market Activities

First Quarter Mg Output Tops Record

• • • **Primary magnesium production** averaged over 20,500 net tons a month during the first quarter of 1944 and exceeded output for all previous periods, according to information just released by the Aluminum and Magnesium Division of the War Production Board. The quarter's record will probably remain as the peak for the duration of the war, since the production curtailments recently announced by WPB took effect during the latter part of March. Secondary recovery rose rapidly in the quarter and reached a new high of 1,750 net tons in March. The sudden increase in secondary recovery resulted from the melting of an accumulation of scrap in facilities previously occupied with the alloying of primary metal. The data on primary output cover all the magnesium produced in the United States, regardless of the forms in which it is recovered. Depending on the process employed, primary magnesium is initially produced as pure notched ingot and also in "raw" or unrefined forms, such as long, crystalline cylinders or muffs; blocks or cheeses of unrefined cell metal; irregular formations of large crystals; and metallic dust. The data released by WPB for 1943 reflect the adjustment of the production statistics for the "raw" forms to a pure ingot equivalent. Since the losses involved in melting these types of metal have decreased to a negligible portion of total production, the adjustment will not be made in the future.

(In millions of lb.)

	Primary		*Secondary*	
	1943	1944	1943	1944
Jan.	20.7	42.0	1.1	2.1
Feb.	21.4	40.9	1.2	2.7
Mar.	26.1	41.0	1.5	3.5
Apr.	27.2*	...	1.7	...
May	30.3*	...	1.7	...
June	30.2*	...	1.6	...
July	33.3*	...	1.7	...
Aug.	34.4*	...	2.1	...
Sept.	32.5*	...	2.5	...
Oct.	36.1*	...	2.7	...
Nov.	36.8	...	2.7	...
Dec.	39.2	...	2.2	...
Total—Yr..	368.2	...	22.7	...

*Revised.

Copper Recovery Office Moves

• • • **On June 2 the Copper** Recovery Inventory Branch will cease operations in New York to move to Washington. This branch, since the inception of the various copper recovery programs, has arranged for war use in their existing forms of approximately 60,000 net tons of copper and copper base alloy materials from surplus and idle inventories.

For some time past, such surpluses have been listed with the regional or district offices of the WPB where the material is located, as well as being listed in the national inventory maintained by the Copper Recovery Inventory Branch. The major function of the branch, since the time that listing of such material with the field offices was initiated, has been to act as a central clearing house.

After June 2, any one wishing and qualified to purchase such surplus material should communicate with the nearest WPB field office for assistance in locating it. If the desired material is not available within the region, the request will be referred to Washington. Those who have been accustomed to dealing directly with the Copper Recovery Inventory Branch are urged to follow the above procedure.

Holders should continue to report their surplus copper and copper base alloy material to the field offices, which in turn will report it to Washington for inclusion in the national inventory.

•

MRC Cancels Canadian Contract

Ottawa

• • • **Termination** of the arrangements under which certain base metal mining operations in Canada were carried on under contract with Metals Reserve Co., the United States procurement agency, has been announced here. Four lead-zinc and two copper properties have been operated in Canada for Metals Reserve Co. The Department of Munitions and Supply pointed out that the demand for the output of these zinc-lead mines is no longer of the same urgency for the war program, and it has been decided to suspend operations so that the labor and materials involved may be put to better use. The department stated that the two copper properties will remain in operation for the present. The four zinc-lead properties affected are: Twin "J" Mines at Duncan, B. C., Kootenay-Florence Mine at Ainsworth, B. C., Lake Geneva Mine at Benny Siding, Ont., and the Tetreault Mines at Notre Dame des Anges, Que.

•

Queens Aluminum Lines Shut

Washington

• • • **The last four potlines** of the government-owned aluminum reduction plant in Queens, N. Y., operated by the Aluminum Co. of America, will be shut down, possibly within the next few days and almost certainly during the first half of June, WPB reported last week. The further curtailment in aluminum production was made to bring virgin metal output more nearly into line with consumption, WPB officials said. Requirements as originally estimated by the various government claimant agencies have been considerably modified, it was explained.

The Alcoa plant affected consisted of eight potlines, two of which were shut down at the beginning of the year and two more within the past month. The annual production capacity of the entire plant was 288,000,000 lb. The plant was selected for curtailment largely because of the fuel saving which will be realized by the cut in electric power deliveries. It is estimated that nearly 2,000,000 tons of bituminous coal a year will be conserved for other essential uses by the shut down.

Two government-owned magnesium metal plants also have been shut down, one at Wingdale, N. Y., operated by Amco Magnesium Corp., it was said. The situation in magnesium metal is similar to that in aluminum in that excess supplies provide a sufficiently ample margin of safety to permit curtailment.

Total labor layoffs in all three plants will affect approximately 2000 workers, it was said by WPB, and arrangements have been made through WMC to handle their placement in other war industries. Curtailments have been only in virgin metal facilities.

REFINER, SMELTER PRICES

(Cents per lb. unless otherwise noted)

Aluminum, 99+%, del'd	15.00
Aluminum, No. 12 Fdy., (No. 2)	12.00
Aluminum, deoxidizing grades	11.00 to 13.25
Antimony, Asiatic, New York	Nominal
Antimony, American, f.o.b. Laredo, Tex.	14.50
Arsenic, prime white, 99%	4.00
Brass, 85-5-5-5 ingots (No. 115)	13.00
Cadmium, del'd	90.00
Cobalt, 97-99% (dollars per lb.)	$2.11
Copper, electro, Conn. Valley	12.00
Copper, electro, New York	11.75
Copper, lake	12.00
Copper, beryllium, 3.75-4.25% Be; dollars per lb. contained Be	$15.00
Gold, U. S. Treas., dollars per oz.	$35.00
Indium, 99.5%, dollars per troy oz.	$7.50
Iridium, dollars per troy oz.	$165.00
Lead, St. Louis	6.35
Lead, New York	6.50
Magnesium, 99.9+%, carlots	20.50
Magnesium, 12-in. sticks, carlots	30.00
Mercury, dollars per 76-lb. flask, f.o.b. shipping point or port of entry	$191 to $193.00
Nickel, electro	35.00
Palladium, dollars per troy oz.	$24.00
Platinum, dollars per oz.	$35.00
Silver, open market, New York, cents per oz.	44.75
Tin, Straits, New York	52.00
Zinc, East St. Louis	8.25
Zinc, New York	8.67

Copper, Copper Base Alloys

(Mill base, cents per lb.)

	Extruded Shapes	Rods	Sheets
Copper	20.87	....	20.87
Copper, H.R.	....	17.37	....
Copper, drawn	....	18.37	....
Low brass, 80%	....	20.40	20.15
High brass	....	....	19.48
Red brass, 85%	....	20.61	20.36
Naval brass	20.37	19.12	24.50
Brass, free cut	....	15.01	....
Commercial bronze, 90%	....	21.32	21.07
Commercal bronze, 95%	....	21.53	21.28
Manganese bronze	24.00	....	28.00
Phos. bronze, A, B, 5%	....	36.50	36.25
Muntz metal	20.12	18.87	22.75
Everdur, Herculoy, Olympic or equal	....	25.50	26.00
Nickel silver, 5%	....	28.75	26.50
Architect bronze	19.12	....	.

Aluminum

(Cents per lb., subject to extras on gage, size, temper, finish, factor number, etc.)

Tubing: 2 in. O.D. x 0.065 in. wall 2S, 40c. (½H); 52S, 61c. (O); 24S, 67½c. (T).

Plate: 0.250 in. and heavier; 2S and 3S, 21.2c.; 52S, 24.2c.; 61S, 22.8c.; 24S, 24.2c.

Flat Sheet: 0.188 in. thickness; 2S and 3S, 22.7c. a lb.; 52S, 26.2c.; 61S, 24.7c.; 24S, 26.7c.

2000-lb. base for tubing; 30,000-lb. base for plate, flat stock.

Extruded Shapes: "As extruded" temper; 2000-lb. base. 2S and 3S, factor No. 1 to 4, 25.5c.; 14S, factor No. 1 to 4, 35c.; 17S, factor No. 1 to 4, 31c.; 24S, factor No. 1 to 4, 34c.; 53S, factor No. 1 to 4, 28c.; 61S, factor No. 1 to 4, 28½c.

The factor is determined by dividing perimeter of shape by weight per lineal foot.

Wire Rod and Bar: Base price; 17ST and 11ST-3, screw machine stock. Rounds: ¼ in., 28½c. per lb.; ½ in., 26c.; 1 in., 24½c.; 2 in., 23c. Hexagonals: ¼ in., 34½c. per lb.; ½ in., 28½c.; 1 in., 25½c.; 2 in., 25½c. 2S, as fabricated, random or standard lengths, ¼ in., 24c. per lb.; ½ in., 25c.; 1 in., 24c.; 2 in., 23c. 24ST, rectangles and squares, random or standard lengths. 0.093-0.187 in. thick by 1.001-2.000 in. wide, 33c. per lb.; 0.751-1.500 in. thick by 2.001-4.000 in. wide, 29c.; 1.501-2.000 in. thick by 4.001-6.000 in. wide, 27½c.

Magnesium

Sheet, rod, tubes, bars, extruded shapes subject to individual quotations. Metal turnings: 100 lb. or more, 46c. a lb.; 25 to 90 lb., 56c.; less than 25 lb., 66c.

NON-FERROUS SCRAP METAL QUOTATIONS

(OPA basic maximum prices, cents per lb., f.o.b. point of shipment, subject to quality, quantity and special preparation premiums)

Copper, Copper Base Alloys

OPA Group 1	
No. 1 wire, No. 1 heavy copper	9.75
No. 1 tinned copper wire, No. 1 tinned heavy copper	9.75
No. 2 wire, mixed heavy copper	8.75
Copper tuyeres	8.75
Light copper	7.75
Copper borings	9.75
No. 2 copper borings	8.75
Lead covered copper wire, cable	6.00*
Lead covered telephone, power cable	6.04
Insulated copper	5.10*
OPA Group 2	
Bell metal	15.50
High grade bronze gears	13.25
High grade bronze solids	11.50*
Low lead bronze borings	11.50*
Babbitt lined brass bushings	13.00
High lead bronze solids	10.00*
High lead bronze borings	10.00*
Red trolley wheels	10.75
Tinny (phosphor bronze) borings	10.50
Tinny (phosphor bronze) solids	10.50
Copper-nickel solids and borings	9.25
Bronze paper mill wire cloth	9.50
Aluminum bronze solids	9.00
Soft red brass (No. 1 composition)	9.00
Soft red brass borings (No. 1)	9.00
Gilding metal turnings	8.50
Contaminated gilded metal solids	8.50
Unlined standard red car boxes	8.25
Lined standard red car boxes	7.75
Cocks and faucets	7.75
Mixed brass screens	7.75
Red brass breakage	7.50
Old nickel silver solids, borings	6.25
Copper lead solids, borings	6.25
Yellow brass castings	6.25
OPA Group 3	
Yellow brass soft sheet clippings	8.625
Yellow rod brass turnings	8.375
Zincy bronze borings	8.00
Zincy bronze solids	8.00
Fired rifle shells	8.25
Brass pipe	7.50
Old rolled brass	7.00
Admiralty condenser tubes	7.50
Muntz metal condenser tubes	7.00
Plated brass sheet, pipe reflectors	6.50
Manganese bronze solids	7.25[1]
Manganese bronze solids	6.25[2]
Manganese bronze borings	6.50[1]
Manganese bronze borings	5.50[2]
OPA Group 4	
Automobile radiators	7.00
OPA Group 5	
Refinery brass	5.00*

*Price varies with analysis. [1] Lead content 0.00 to 0.40 per cent. [2] Lead content 0.41 to 1.00 per cent.

Other Copper Alloys

Briquetted Cartridge Brass Turnings	8.625
Cartridge Brass Turnings, Loose	7.875
Loose Yellow Brass Trimmings	7.875

Aluminum

Plant scrap, segregated	
All S-type alloys (except 2S)	8.50
2S solids	8.00
High grade alloys	7.00
Low grade alloys	6.50
Borings and turnings	
High grade alloys	5.50
Low grade alloys	5.00
Plant scrap, mixed	
All solids	6.00
Borings and turnings	4.00
Obsolete scrap	
Pure cable	8.00
Old sheet and utensils	7.00
Old castings and forgings	6.50
Pistons, free of struts	6.50
Pistons, with struts	4.50
Old alloy sheet	5.50

For old castings and forgings, pistons, sheets, add ½c. lb. for lots 1000 to 19,999 lb.; for other scrap add 1c.; for lots over 19,999 lb. add 1½c. a lb.

Magnesium

Segregated plant scrap	
Pure solids and all other solids, exempt	
Borings and turnings	8.00
Mixed, contaminated plant scrap	
Grade 1 solids	11.00
Grade 1 borings and turnings	7.00
Grade 2 solids	9.00
Grade 2 borings and turnings	5.00

For lots over 1499 lb. add 1c. per lb.

Zinc

New zinc clippings, trimmings	7.25
Engravers', lithographers' plates	7.25
Old zinc scrap	5.75
Unsweated zinc dross	5.50
Die cast slab	5.50
New die cast scrap	4.95
Radiator grilles, old and new	4.95
Old die cast scrap	4.50

Lead

Deduct 0.55c. a lb. from refined metal basing point prices or soft and hard lead inc. cable, for f.o.b. point of shipment price.

Nickel

Ni content 98+%, Cu under ½%, 26c. per lb.; 90 to 98% Ni, 26c. per lb. contained Ni.

ELECTROPLATING ANODES AND CHEMICALS

Anodes

(Cents per lb., f.o.b. shipping point)

Copper: Cast, elliptical, 15 in. and longer	25⅛
Electrolytic, full size	22⅞
cut to size	30⅛
Rolled, oval, straight, 15 in. and longer	23¼
Curved	24¼
Brass: Cast, 82-20, elliptical, 15 in. and longer	23⅝
Zinc: Cast, 99.99, 16 in. and over	16¼
Nickel: 99% plus, cast	47
Rolled, depolarized	48
Silver: Rolled, 999 fine per Troy (1-9) oz., per oz.	58

Chemicals

(Cents per lb., delivery from New York)

Copper cyanide, tech., 100-lb. bbls. 1-5	5.65
Copper sulphate, 99.5 crystals, bbls.	13.00–13.50
Nickel salts, single, 425-lb. bbls.	34.00
Silver cyanide, 100 oz., lots	40.32–41.12
Sodium cyanide, 96% dom., 100-lb. dms.	0.15
Zinc cyanide, 100-lb. dms.	33.00
Zinc, sulphate, 89% crystals, bbls.	6.80

SCRAP

. . . News and Market Activities

E. C. Barringer Predicts Postwar Prosperity Period for Scrap Industry

Chicago

• • • **Continued scrap demand** through the third quarter and a postwar period of prosperity for the scrap industry was forecast here last week by Edwin C. Barringer, president of the Institute of Scrap Iron and Steel.

Even the most pessimistic estimates do not concede a drop of more than four or five per cent in demand for several months to come, Barringer said. For the postwar period he foresaw two to five years prosperity after short reconversion period following the war.

"Steel will be the base of our civilization as long as we can foresee," he declared.

A decline in scrap demand which had been anticipated early in 1944 along with predictions of decreasing steel production never materialized because the nation's manufacturers replaced completed earlier war programs with heavy artillery and new war products, all of which tended to increase scrap activities.

In the Chicago district, he found mill inventories of purchased scrap down, with an average reserve of from 60 to 90 days. If a slump in steel production materializes late this year, inventories will jump to six months supply, he believed.

Commenting on rejections by local mills because of non-ferrous contamination, Barringer stated that his examination of a local mill's records showed that rejections amounted to an average of 3 per cent in the first four months of 1944. During this period the rejection rate ranged from 2.5 per cent to 5.5 per cent, the peak being reached in April. (Recent reports indicate such rejections again have declined.)

•

PITTSBURGH — Open hearth grades are becoming scarcer with some buyers unable to get as much material as they want. While turnings are still in the realms of being easier, this condition does not apply where the prime grades are concerned. Some consumers are finding that their stock piles have been going down faster than was the case a few months ago, and in some cases too fast for comfort.

•

CLEVELAND—Local scrap buying has slowed to a low point. Two major buyers in the area have stopped all but a dribble of heavy melting purchases and are taking blast furnace grades in very limited quantities. Heavy melting is being offered freely with few local takers. Blast furnace grades in particular are moving into Cleveland by boat. Mill inventories are very comfortable. Some hesitancy due to the imminence of the invasion and its possible effect on the scrap price situation is also affecting inventory building.

•

DETROIT—Blast furnace scrap is being accepted locally at 50c. per ton below ceiling prices. Scattered machine shop turnings sales are also reported below ceiling. With the largest user of electric furnace grades out of the market, interest in this scrap is declining, coinciding with general disinterest in other grades.

•

CINCINNATI—The market has turned definitely quiet. Dealers indicate that virtually all the consumers in the area appear to be well covered and are accepting only good material. They are willing to pay ceiling prices but refusing premiums and allocations. Currently, there seems to be sufficient scrap going through the market to take care of needs, but the heavy pressure for materials seems to have passed.

•

BIRMINGHAM — Steel mills buying scrap in this area are only absorbing $1 per springboard on heavy melting steel where $2 per ton is allowed, and no springboard is being absorbed on bundle sheet scrap where $2 springboard is permitted. Market sources here assert that this price reduction imperils the continued operations of some scrap dealers who are faced with the general problem of high labor costs and other wartime expenses.

•

BOSTON — Pennsylvania mill rejections are coming thick and fast, not only of turnings, bushelings, etc., but solids as well. Rejections reported include eight cars of heavy steel, two cars mixed borings and turnings for which mill offered $1 a ton, a car of bushelings reported as containing stainless steel turnings billed at better than $600 for which $16 was paid, and a grist of carlots of turnings said to contain alloys. As a result, movement of material to Pennsylvania is slumping.

•

PHILADELPHIA — Most consumers continue to show little interest in turnings, some holding up on shipments while others are taking scheduled amounts. Future contracts for turnings may be made at prices less than $13.75. Stricter specifications are continuing and will probably be extended to those mills who have not yet instituted this practice. Dealers are now facing the problem of disposing of contaminated turnings. The district's largest consumer continues to buy heavily and has received shipments on allocations for one and perhaps two of its plants. Bethlehem's purchases of war front scrap at Brooklyn and Frederick, Md., at considerably higher than any dealers' bids has caused some concern among the regular trade channels, but this has been explained by the company's desire to be aware of the possibilities of explosives in its scrap receipts.

•

BUFFALO—Steady receipts of heavy melting and No. 2 bundles from the Atlantic Seaboard by barge canal have placed Buffalo district mills in an excellent position. The leading consumer has received 10,000 tons via canal so far and the next largest user also has unloaded heavy shipments. More fleets are in the canal and war scrap is expected to appear among the heavy melting in later shipments. The cross-state waterway is expected to carry record breaking cargoes of scrap this summer. On the other hand, four boat loads brought downlake this season have cleared up all the scrap earmarked for Buffalo in the Duluth region. The four cargoes aggregated around 20,000 tons.

•

ST. LOUIS — With heavier shipments from the industries and railroads, the scrap situation has improved and mills' inventories are in goods shape. Granite City Steel Co. has resumed operations, and has lifted its embargo on scrap slightly. Borings and turnings are in oversupply.

•

CHICAGO—Market conditions continue quiet with most buyers reluctant to make long term commitments until the military situation clarifies. A firmer tone is indicated in purchases of blast furnace material in outlying districts, but this has yet to be reflected in the Chicago market and previously reported discounts from OPA ceilings prevail. Market on heavy melting grades continues firm with yard scrap supplies restricted by labor shortage.

No Midyear Scrap Convention To Be Held This Year

Chicago

• • • **No midyear convention** will be held in 1944 by the Institute of Scrap Iron and Steel, Edwin C. Barringer, president and executive secretary, said here, May 31. Instead National committee meetings will be held June 28 in Pittsburgh, and the National board of directors will meet there June 29. Barringer announced the institution of a Public Relations department for the Institute and the appointment of chapter representatives.

IRON AND STEEL (OTHER THAN RAILROAD) SCRAP

(All Prices Are Per Gross Ton)

	BASIC OPEN HEARTH GRADES		BLAST FURNACE GRADES				ELECTRIC FURNACE, ACID OPEN HEARTH AND FOUNDRY GRADES										
							Low Phos.		Heavy Structural and Plate			Foundry Steel					
	No. 1 & 2 Hvy. Melt. No. 1 Cp. Blk. Shts. No. 1 & 2 Bundles No. 1 Busheling	Unbaled* Machine Shop Turnings	Mixed Borings and Turnings	Cast Iron Borings	Shovelling Turnings	No. 2 Busheling	Billet, Bloom, Forge Crops	Bar Crops, Punchings Plate Scrap and Cast Steel	3 ft. and Under	2 ft. and Under	1 ft. and Under	2 ft. and Under	1 ft. and Under	Auto. Springs, and Crankshafts	Alloy Free Low Phos. and Sulphur Turnings	Heavy Axle and Forge Turn. First Cut	Electric Furnace Bundles
Pittsburgh, Brackenridge, Butler, Monessen, Midland, Johnstown, Sharon, Canton, Steubenville, Warren, Youngstown, Weirton	$20.00	$15.00	$15.00	$16.00	$17.00	$17.50	$25.00	$22.50	$21.50	$22.00	$22.50	$21.50	$22.00	$21.00	$18.00	$19.50	$21.00
Cleveland, Middletown, Cincinnati, Portsmouth	19.50	14.50	14.50	15.50	16.50	17.00	24.50	22.00	21.00	21.50	22.00	21.00	21.50	20.50	17.50	19.00	20.50
Chicago, Claymont, Coatesville, Conshohocken, Harrisburg, Phoenixville, Sparrows Point	18.75	13.75	13.75	14.75	15.75	16.25	23.75	21.25	20.25	20.75	21.25	20.25	20.75	19.75	16.75	18.25	19.75
Ashland, Ky.	19.50	14.50	14.50	15.50	16.50	17.00	24.50	22.00	21.00	21.50	22.00	21.00	21.50	20.50	17.50	19.00	20.50
Buffalo, N. Y.	19.25	14.25	14.25	15.25	16.25	16.75	24.25	21.75	20.75	21.25	21.75	20.75	21.25	20.25	17.25	18.75	20.25
Bethlehem, Pa.; Kokomo, Ind.	18.25	13.25	13.25	14.25	15.25	15.75	23.25	20.75	19.75	20.25	20.75	19.75	20.25	19.25	16.25	17.75	19.25
Duluth, Minn.	18.00	13.00	13.00	14.00	15.00	15.50	23.00	20.50	19.50	20.00	20.50	19.50	20.00	19.00	16.00	17.50	19.00
Detroit, Mich.	17.85	12.85	12.85	13.85	14.85	15.35	22.85	20.35	19.35	19.85	20.35	19.35	19.85	18.85	15.85	17.35	18.85
Toledo, Ohio	....	12.85	12.85	13.85	14.85	15.35	....	....	....	....	....	....	....	....	....	....	....
St. Louis, Mo.	17.50	12.50	12.50	13.50	14.50	15.00	22.50	20.00	19.00	19.50	20.00	19.00	19.50	18.50	15.50	17.00	18.50
Atlanta, Ga.; Alabama City, Ala.; Birmingham, Los Angeles, Pittsburg, Cal; San Francisco	17.00	12.00	12.00	13.00	14.00	14.50	22.00	19.50	18.50	19.00	19.50	18.50	19.00	18.00	15.00	16.50	18.00
Minnequa, Colo.	16.50	11.50	11.50	12.50	13.50	14.00	21.50	19.00	18.00	18.50	19.00	18.00	18.50	17.50	14.50	16.00	17.50
Seattle, Wash.	14.50	9.50	9.50	10.50	11.50	12.00	19.50	17.00	16.00	16.50	17.00	16.00	16.50	15.50	12.50	14.00	15.50

* Baled turnings are $5 per gross ton higher.

BUNDLES: Tin can bundles are $4 below dealers' No. 2 bundles; No. 3 bundles are $2 less than No. 1 heavy melting.

AT NEW YORK CITY or Brooklyn, the maximum shipping point price is $15.33 for No. 1 heavy melting, f.o.b. cars, f.a.s. vessel or loaded on trucks. Minimum set at $14 per gross ton at any shipping point in U. S. Other grades carry differentials similar to those in table. New Jersey prices must be computed on basis of all-rail. At Boston the maximum is $15.05 for No. 1 f.o.b. cars, f.a.s. vessel or loaded on trucks. Shipments from a New England shipping point to a consumer outside New England carry maximum transportation charge of $6.66 per ton.

SWITCHING CHARGES: Deductions for shipping points within basing point (cents per gross ton) are: Chicago, 84c.; Pittsburgh, Brackenridge, 55c.; Detroit, 53c.; Midland, Johnstown, Sharon, Youngstown, Warren, Weirton, Cleveland, Toledo, Los Angeles, San Francisco, Pittsburg, 42c.; Seattle, 38c.; Buffalo, Claymont, Harrisburg, 86c.; Atlanta, Birmingham, 32c.; Butler, Monessen, Canton, Steubenville, Cincinnati*, Portsmouth, Ashland, Coatesville, Phoenixville, Bethlehem, Kokomo, Duluth and St. Louis, 28c.; Alabama City, Ala., 26c.; Minnequa, Colo., 22c.; Middletown, 14c.; Conshohocken, Sparrows Point, 11c.

*Basic open hearth and foundry grades, and auto springs and crankshafts, deduct 80c. per ton.

BASING POINT includes switching districts of city named.

Basing point	Switching districts:
Pittsburgh	Bessemer, Homestead, Duquesne, Munhall, McKeesport
Cincinnati	Newport
St. Louis	Granite City, E. St. Louis, Madison, Ill.
Chicago	Gary
Claymont	Chester, Pa.
San Francisco	So. San Francisco, Niles, Oakland

MAXIMUM SHIPPING POINT PRICE: Where shipment is wholly or partially by rail or vessel, or combination of rail and vessel, the scrap is at shipping point when placed f.o.b. railroad or f.a.s. vessel. For motor vehicle shipments scrap is at shipping point when loaded. Then maximum shipping point price shall be: (a) For shipping point located within a basing point, prices shown in above table for scrap at basing point in which shipping point is located, minus applicable switching charge deduction shown in paragraph above labeled "Switching Charges." (b) For shipping points outside basing point, price listed in above table hereof for scrap at most favorable basing point, minus lowest charge for transportation from shipping point to such basing point by rail or water carrier or combination. Where vessel movement is involved, in lieu of established dock charge or any cost customarily incurred at the dock, 75c. per ton must be included as part of deduction in computing shipping point price; 50c. at Memphis; $1 at Great Lakes ports; and $1.25 at New England ports. If no established transportation rate exists for a portion of movement from shipping to basing point, actual charge or cost customarily incurred by shipper in such portion of movement shall be included as part of deduction in computing shipping point price. For exceptions see official order.

UNPREPARED SCRAP: For unprepared scrap, maximum prices shall be $3.50 (and in the case of the material from which No. 1, No. 2, and No. 3 bundles are made $4) less than maximum prices for the corresponding prepared scrap. In no case, however, shall electric furnace, acid open hearth and foundry grades be used as the corresponding prepared scrap. A preparation-in-transit charge for unprepared scrap is provided.

NEW LISTED GRADES: Priced in dollars per gross ton less than No. 1 heavy melting steel. Pit scrap, ladle skulls, slag reclaim, etc., of 85% or more Fe priced less $2; 75 to 85% Fe less $4; under 75% Fe less $8 per ton. Mill scale less $8 per ton. Mill cinder and grindings, shipping point maximum price of $4 per gross ton at all U. S. shipping points.

CHEMICAL BORINGS: No. 1 (new, clean, containing not more than 1% oil), $1 less than No. 1 heavy melting; No. 2 (new, clean, containing not more than 1.5% oil), $2 less than No. 1 heavy melting. If loaded in box cars add 75c. mill scale, $8 less than No. 1 heavy melting.

Tool Steel Scrap Prices (MPR 379)

SEGREGATED	Solids Per Lb. Cont. W	Turnings Per Lb. Cont. W
Type 1. 12% min. W, 1% max. Mo	$1.80	$1.60
Type 2. 5 to 12% W, 1% max. Mo	1.60	1.40
Type 3. 1 to 5% W, 1.5% max. Mo	1.25	1.25
*Type 4. 7% min. Mo, 2% max. W	0.125	0.105
*Type 5. 3.5 to 6% Mo, 4.5 to 8% W	0.135	0.115

UNSEGREGATED SOLIDS	UNSEGREGATED TURNINGS
$1.50 per lb. contained W if 5% or more.	$1.30 per lb. contained W if 5% or more.
$1.15 per lb. contained W if 1 to 5%.	$1.00 per lb. contained W if 1 to 5%.
$0.80 per lb. contained Mo if 1.5% or more.	$0.70 per lb. contained Mo if 1.5% or more.

If both W and Mo are within ranges, payment may be for both W and Mo content.

*Per lb. of scrap material.

If segregated, a premium of $1.50 per lb. of contained Co allowed if Co content is 3% or over. No scrap considered segregated if Co content ranges between 0.5 and 3%.

If Cu or Ni content over 0.25%, price shall be reduced by 50%.

If 500 lb. or less is sold, either segregated or unsegregated, price shall be reduced 2c. per lb. of scrap material.

Cast Iron Scrap

Maximum on-line price, per gross ton, for any of the following cast grades will be the price shown at the highest priced zone in which the railroad operates or is located.

	Per Gross Ton		
	Zone A	Zone B	Zone C
Cast Iron, No. 1	$18.00	$19.00	$20.00
Cast Iron, No. 2	17.00	18.00	19.00
Cast Iron, No. 3	14.50	15.50	16.50
Cast Iron, No. 4	13.25	14.25	15.25
Cast Iron Brake Shoes	13.25	14.25	15.25
Malleable	20.00	21.00	22.00
Wheels, No. 1	18.00	19.00	20.00

Zone A includes Mont., Idaho, Wyo., Nev., Utah, Ariz., and N. M. Zone B includes N. D., S. D., Neb., Colo., Kan., Okla., Texas, and Fla. Zone C includes all states not named in zones A and B, and includes switching district of Kansas City, Kansas-Missouri.

For cast, an in-transit preparation fee will be applicable only for preparing Cast ron No. 3 into Cast Iron No. 1, for which the maximum preparation fee shall be $3.50 per gross ton. (Previous dealer fee was $2.50.)

CAST IRON GRADE DEFINITIONS: Cast Iron No. 1—Cast Iron scrap such as columns, pipe, plates and/or castings of miscellaneous nature, but free from stove plate, brake shoes, and/or burnt scrap. Must be cupola size not over 24 x 30 in. and no pieces to weigh more than 150 lb. Free of foreign material. No. 2—Cast iron scrap in pieces weighing over 150 lb. not more than 500 lb. and free from burnt cast. No. 3—Cast iron scrap in pieces over 500 lb., includes cylinders, driving wheel centers, and/or all other castings. Free from hammer blocks or bases. No. 4—Burnt cast iron scrap such as grate bars, stove parts, and/or miscellaneous burnt scrap. No. 5—Driving and/or car brake shoes of all types except composition filled. Malleable—Malleable parts of automobiles, railroad cars, and locomotives. No. 7—Wheels, No. 1, includes cast iron car and/or locomotive wheels.

Comparison of Prices . . .

Advances Over Past Week in Heavy Type; Declines in *Italics*. [Prices Are F.O.B. Major Basing Points]

Flat Rolled Steel: (Cents Per Lb.)	June 6, 1944	May 30, 1944	May 2, 1944	June 8, 1943
Hot rolled sheets	2.10	2.10	2.10	2.10
Cold rolled sheets	3.05	3.05	3.05	3.05
Galvanized sheets (24 ga.)	3.50	3.50	3.50	3.50
Hot rolled strip	2.10	2.10	2.10	2.10
Cold rolled strip	2.80	2.80	2.80	2.80
Plates	2.10	2.10	2.10	2.10
Plates, wrought iron	3.80	3.80	3.80	3.80
Stain's c.r. strip (No. 302)	28.00	28.00	28.00	28.00
Tin and Terne Plate: (Dollars Per Base Box)				
Tin plate, standard cokes	$5.00	$5.00	$5.00	$5.00
Tin plate, electrolytic	4.50	4.50	4.50	4.50
Special coated mfg. ternes	4.30	4.30	4.30	4.30
Bars and Shapes: (Cents Per Lb.)				
Merchant bars	2.15	2.15	2.15	2.15
Cold finished bars	2.65	2.65	2.65	2.65
Alloy bars	2.70	2.70	2.70	2.70
Structural shapes	2.10	2.10	2.10	2.10
Stainless bars (No. 302)	24.00	24.00	24.00	24.00
Wrought iron bars	4.40	4.40	4.40	4.40
Wire and Wire Products: (Cents Per Lb.)				
Plain wire	2.60	2.60	2.60	2.60
Wire nails	2.55	2.55	2.55	2.55
Rails: (Dollars Per Gross Ton)				
Heavy rails	$40.00	$40.00	$40.00	$40.00
Light rails	40.00	40.00	40.00	40.00
Semi-Finished Steel: (Dollars Per Gross Ton)				
Rerolling billets	$34.00	$34.00	$34.00	$34.00
Sheet bars	34.00	34.00	34.00	34.00
Slabs, rerolling	34.00	34.00	34.00	34.00
Forging billets	40.00	40.00	40.00	40.00
Alloy blooms, billets, slabs	54.00	54.00	54.00	54.00
Wire Rods and Skelp: (Cents Per Lb.)				
Wire rods	2.00	2.00	2.00	2.00
Skelp	1.90	1.90	1.90	1.90

Pig Iron: (Per Gross Ton)	June 6, 1944	May 30, 1944	May 2, 1944	June 8, 1943
No. 2 fdy., Philadelphia	$25.84	$25.84	$25.84	$25.89
No. 2, Valley furnace	24.00	24.00	24.00	24.00
No. 2, Southern Cin'ti	25.11	25.11	25.11	24.68
No. 2, Birmingham	20.38	20.38	20.38	20.38
No. 2, foundry, Chicago†	24.00	24.00	24.00	24.00
Basic, del'd eastern Pa.	25.34	25.34	25.34	25.39
Basic, Valley furnace	23.50	23.50	23.50	23.50
Malleable, Chicago†	24.00	24.00	24.00	24.00
Malleable, Valley	24.00	24.00	24.00	24.00
L. S. charcoal, Chicago	37.34	37.34	37.34	31.34
Ferromanganese‡	135.00	135.00	135.00	135.00

†The switching charge for delivery to foundries in the Chicago district is 60c. per ton.
‡For carlots at seaboard.

Scrap: (Per Gross Ton)				
Heavy melt'g steel, P'gh.	$20.00	$20.00	$20.00	$20.00
Heavy melt'g steel, Phila.	18.75	18.75	18.75	18.75
Heavy melt'g steel, Ch'go	18.75	18.75	18.75	18.75
No. 1 hy. comp. sheet, Det.	17.85	17.85	17.85	17.85
Low phos. plate, Youngs'n	22.50	22.50	22.50	22.50
No. 1 cast, Pittsburgh	20.00	20.00	20.00	20.00
No. 1 cast, Philadelphia	20.00	20.00	20.00	20.00
No. 1 cast, Ch'go	20.00	20.00	20.00	20.00
Coke, Connellsville: (Per Net Ton at Oven)				
Furnace coke, prompt	$7.00	$7.00	$7.00	$6.50
Foundry coke, prompt	8.25	8.25	8.25	7.50
Non-Ferrous Metals: (Cents per Lb. to Large Buyers)				
Copper, electro., Conn.	12.00	12.00	12.00	12.00
Copper, Lake	12.00	12.00	12.00	12.00
Tin (Straits), New York	52.00	52.00	52.00	52.00
Zinc, East St. Louis	8.25	8.25	8.25	8.25
Lead, St. Louis	6.35	6.35	6.35	6.35
Aluminum, Virgin, del'd.	15.00	15.00	15.00	15.00
Nickel, electrolytic	35.00	35.00	35.00	35.00
Magnesium, ingot	20.50	20.50	20.50	20.50
Antimony (Asiatic), N. Y.	16.50	16.50	16.50	16.50

The various basing points for finished and semi-finished steel are listed in the detailed price tables, pages 139-147.

Composite Prices . . .

Starting with the issue of April 22, 1943, the weighted finished steel price index was revised for the years 1941, 1942 and 1943. See explanation of the change on page 90 of the April 22, 1943, issue.

	FINISHED STEEL	PIG IRON	SCRAP STEEL
June 6, 1944	2.25513c. a Lb.	$23.61 a Gross Ton	$19.17 a Gross Ton
One week ago	2.25513c. a Lb.	$23.61 a Gross Ton	$19.17 a Gross Ton
One month ago	2.25513c. a Lb.	$23.61 a Gross Ton	$19.17 a Gross Ton
One year ago	2.26190c. a Lb.	$23.61 a Gross Ton	$19.17 a Gross Ton

	FINISHED STEEL HIGH	FINISHED STEEL LOW	PIG IRON HIGH	PIG IRON LOW	SCRAP STEEL HIGH	SCRAP STEEL LOW
1943	2.25513c.,	2.25513c.,	$23.61	$23.61	$19.17	$19.17
1942	2.26190c.,	2.26190c.,	23.61	23.61	19.17	19.17
1941	2.43078c.,	2.43078c.,	$23.61, Mar. 20	$23.45, Jan. 2	$22.00, Jan. 7	$19.17, Apr. 10
1940	2.30467c., Jan. 2	2.24107c., Apr. 16	23.45, Dec. 23	22.61, Jan. 2	21.83, Dec. 30	16.04, Apr. 9
1939	2.35367c., Jan. 3	2.26689c., May 16	22.61, Sept. 19	20.61, Sept. 12	22.50, Oct. 3	14.08, May 16
1938	2.58414c., Jan. 4	2.27207c., Oct. 18	23.25, June 21	19.61, July 6	15.00, Nov. 22	11.00, June 7
1937	2.58414c., Mar. 9	2.32263c., Jan. 4	23.25, Mar. 9	20.25, Feb. 16	21.92, Mar. 30	12.67, June 8
1936	2.32263c., Dec. 28	2.05200c., Mar. 10	19.74, Nov. 24	18.73, Aug. 11	17.75, Dec. 21	12.67, June 9
1935	2.07642c., Oct. 1	2.06492c., Jan. 8	18.84, Nov. 5	17.83, May 14	13.42, Dec. 10	10.33, Apr. 29
1934	2.15367c., Apr. 24	1.95757c., Jan. 2	17.90, May 1	16.90, Jan. 27	13.00, Mar. 13	9.50, Sept. 25
1933	1.95578c., Oct. 3	1.75836c., May 2	16.90, Dec. 5	13.56, Jan. 3	12.25, Aug. 8	6.75, Jan. 3
1932	1.89196c., July 5	1.83901c., Mar. 1	14.81, Jan. 5	13.56, Dec. 6	8.50, Jan. 12	6.43, July 5
1931	1.99626c., Jan. 13	1.86586c., Dec. 29	15.90, Jan. 6	14.79, Dec. 15	11.33, Jan. 6	8.50, Dec. 29
1930	2.25488c., Jan. 7	1.97319c., Dec. 9	18.21, Jan. 7	15.90, Dec. 16	15.00, Feb. 18	11.25, Dec. 9
1929	2.31773c., May 28	2.26498c., Oct. 29	18.71, May 14	18.21, Dec. 17	17.58, Jan. 29	14.08, Dec. 3

Weighted index based on steel bars, beams, tank plates, wire, rails, black pipe, hot and cold-rolled sheets and strip, representing 78 per cent of the United States output. Index recapitulated in Aug. 28, 1941, issue.

Based on averages for basic iron at Valley furnaces and foundry iron at Chicago, Philadelphia, Buffalo, Valley and Southern iron at Cincinnati.

Based on No. 1 heavy melting steel scrap quotations to consumers at Pittsburgh, Philadelphia and Chicago.

. . . Prices of Finished Iron and Steel

Steel prices shown here are f.o.b. basing points, in cents per lb., unless otherwise indicated. Extras apply. Delivered prices do not reflect 3% tax on freight. (1) Mill run sheet, 10c. per lb. under base; primes 25c. above base. (2) Unassorted 8-lb. coating. (3) Widths up to 12-in. (4) 0.25 carbon and less. (5) Applise to certain width and length limitations. (6) For merchant trade. (7) For straight length material only from producer to consumer. Discount of 25c. per 100 lb. to fabricators. (8) Also shafting. For quantities of 20,000 to 29,999 lb. (9) Carload lot in manufacturing trade. (10) Prices do not apply if rail and water is not used. (12) Boxed. (13) Portland and Seattle price, San Francisco 2.50c. (14) This base price to be used in figuring annealed, bright finish wires, commercial spring wire.

Basing Point → / Product ↓	Pittsburgh	Chicago	Gary	Cleveland	Birmingham	Buffalo	Youngstown	Sparrows Point	Granite City	Middletown, Ohio	Gulf Ports, Cars	Provo, Utah	[10] Pacific Ports, Cars	DELIVERED TO Detroit	New York	Philadelphia
Hot Rolled Sheets	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.20¢	2.10¢			2.65¢	2.20¢	2.34¢	2.27¢
Cold Rolled Sheets[1]	3.05¢	3.05¢	3.05¢	3.05¢		3.05¢	3.05¢		3.15¢	3.05¢			3.70¢	3.15¢	3.39¢	3.37¢
Galv. Sheets (24 gage)	3.50¢	3.50¢	3.50¢		3.50¢	3.50¢	3.50¢	3.50¢	3.60¢	3.50¢			4.05¢		3.74¢	3.67¢
Enameling Sheets (20 gage)	3.35¢	3.35¢	3.35¢	3.35¢			3.35¢		3.45¢	3.35¢			4.00¢	3.45¢	3.71¢	3.67¢
Long Ternes[2]	3.80¢	3.80¢	3.80¢										4.55¢		4.16¢	4.12¢
Hot Rolled Strip[2]	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢		2.10¢			2.10¢			2.75¢	2.20¢	2.46¢	
Cold Rolled Strip[4]	2.80¢	2.90¢		2.80¢			2.80¢	(Worcester = 3.00¢)						2.90¢	3.16¢	
Cooperage Stock Strip	2.20¢	2.20¢			2.20¢		2.20¢								2.56¢	
Commodity C-R Strip	2.95¢	3.05¢		2.95¢			2.95¢	(Worcester = 3.35¢)						3.05¢	3.31¢	
Coke Tin Plate, Base Box	$5.00	$5.00	$5.00						$5.10						5.36¢	5.32¢
.50 Electro Tin Plate, Box	$4.50	$4.50	$4.50						$4.60							
.75 Electro Tin Plate, Box	$4.65		$4.65						$4.75							
Black Plate (29 gage)[5]	3.05¢	3.05¢	3.05¢						3.15¢				4.05¢[12]			3.37¢
Mfg. Ternes, Special Box	$4.30	$4.30	$4.30						$4.40							
Carbon Steel Bars	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢		(Duluth = 2.25¢)			2.50¢		2.80¢	2.25¢	2.49¢	2.47¢
Rail Steel Bars[6]	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢					2.50¢		2.80¢			
Reinforcing (Billet) Bars[7]	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢			2.50¢		2.55¢[13]	2.25¢	2.39¢	
Reinforcing (Rail) Bars[7]	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢				2.50¢		c2.55¢[13]	2.25¢		2.47¢
Cold Finished Bars[8]	2.65¢	2.65¢	2.65¢	2.65¢		2.65¢		(Detroit = 2.70¢)		(Toledo = 2.80¢)					2.99¢	2.97¢
Alloy Bars, Hot Rolled	2.70¢	2.70¢				2.70¢	(Bethlehem, Massillon, Canton = 2.70¢)							2.80¢		
Alloy Bars, Cold Drawn	3.35¢	3.35¢	3.35¢	3.35¢		3.35¢								3.45¢		
Carbon Steel Plates	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢		2.10¢	(Coatesville and Claymont = 2.10¢) 2.10¢	2.35¢		2.45¢	2.60¢	2.65¢	2.32¢	2.29¢	2.15¢
Floor Plates	3.35¢	3.35¢									3.70¢		4.00¢		3.71¢	3.67¢
Alloy Plates	3.50¢	3.50¢			(Coatesville = 3.50¢)						3.95		4.15¢		3.76¢	3.59¢
Structural Shapes	2.10¢	2.10¢	2.10¢		2.10¢	2.10¢		(Bethlehem = 2.10¢)			2.45¢		2.75¢		2.27¢	2.215¢
SPRING STEEL, C-R 0.26 to 0.50 Carbon	2.80¢			2.80¢			(Worcester = 3.00¢)									
0.51 to 0.75 Carbon	4.30¢			4.30¢			(Worcester = 4.50¢)									
0.76 to 1.00 Carbon	6.15¢			6.15¢			(Worcester = 6.35¢)									
1.01 to 1.25 Carbon	8.35¢			8.35¢			(Worcester = 8.55¢)									
Bright Wire[14]	2.60¢	2.60¢		2.60¢	2.60¢		(Worcester = 2.70¢)		(Duluth = 2.65¢)				3.10¢			2.92¢
Galvanized Wire	Add proper size extra and galvanizing extra to Bright Wire base.															
Spring (High Carbon)	3.20¢	3.20¢		3.20¢			(Worcester = 3.30¢)						3.70¢			3.52¢
Steel Sheet Piling	2.40¢	2.40¢				2.40¢							2.95¢			2.72¢

EXCEPTIONS TO PRICE SCHED. NO. 6

Slabs—Andrews Steel Co. $41 basing pts.; Wheeling Steel Corp. $34 Portsmouth, Ohio; Empire Sheet & Tin Plate Corp. $41; Phoenix Iron Co. (rerolling) $41, (forging) $47; Granite City Steel Co. $47.50.

Blooms—Phoenix Iron Co. (rerolling) $41, (forging) $47.

Sheet Bar—Empire Sheet & Tin Plate Co. $39 mill; Wheeling Steel Corp. $38 Portsmouth, Ohio.

Billets, Forging—Andrews Steel Co. $50 basing pts.; Follansbee Steel Corp. $49.50 Toronto; Phoenix Iron Co. $47.00 mill. Geneva Steel Co. $64.64 f.o.b. Pacific Coast Ports.

Billets, Rerolling—Continental Steel Corp. may charge Acme Steel in Chicago switching area $34 plus freight from Kokomo, Ind.; Northwestern Steel & Wire Co. (Lend-Lease) $41 mill; Wheeling Steel Corp. (small) $36 Portsmouth, Ohio; (blooming mill sizes) applicable base, f.o.b. Portsmouth, Ohio; Stanley Works may sell Washburn Wire Co. under allocation at $39 Bridgeport, Conn.; Keystone Steel & Wire Co. may sell Acme Steel Co. at Chicago base, f.o.b. Peoria; Phoenix Iron Co. $41 mill; Continental Steel Corp. (1¾ x 1¾) $39.50, (2 x 2) $40.60 Kokomo, Ind. (these prices include $1 size extra); Keystone Steel & Wire Co. $36.40 Peoria; Connors Steel Co. $50.69 Birmingham; Ford Motor Co. $34 Dearborn, Mich. Geneva Steel Co. $58.64 f.o.b. Pacific Coast ports.

Structural Shapes—Phoenix Iron Co. $2.35 basing pts. (export) $2.50 Phoenixville; Knoxville Iron Co. $2.30 basing points.

Bar Size Shapes—(Angles) W. Ames & Co., 10 tons or over, $3.10 mill.

Rails—Sweet Steel Co. (rail steel) $50 mill; West Virginia Rail Co. (lightweight) on allocation based Huntington, W. Va.; Colorado Fuel & Iron Corp., $45 Pueblo.

Hot Rolled Plate—Granite City Steel Co. $2.65 mill; Knoxville Iron Co. $2.25 basing pts.; Kaiser Co. and Geneva Steel Co. $3.20 Pacific Ports; Central Iron & Steel Co. $2.50 basing points; Granite City Steel Co. $2.35 Granite City.

Merchant Bars—W. Ames Co., 10 tons and over, $2.85 mill; Eckels-Nye Steel Corp., $2.50 basing pts. (rail steel) $2.40; Phoenix Iron Co. $2.40 basing pts.; Sweet Steel Co. (rail steel) $2.35 mill; Joslyn Mfg. & Supply Co., $2.35 Chicago; Calumet Steel Dic., Borg Warner Corp. (8 in. mill bars) $2.35 Chicago; Knoxville Iron Co. $2.30 basing pts. Laclede Steel Co., sales to LaSalle Steel granted Chicago base, f.o.b. Madison, Ill. Milton Mfg. Co. $2.75 f.o.b. Milton, Pa.

Reinforcing Bars—W. Ames & Co., 10 tons and over, $2.85 mill; Sweet Steel Co. (rail steel) $2.35 mill; Columbia Steel Co. $2.50 Pacific Ports.

Cold Finished Bars—Keystone Drawn Steel Co. on allocation, Pittsburgh c.f. base plus c/l freight on hot rolled bars Pittsburgh to Spring City, Pa.; New England Drawn Steel Co. on allocation outside New England, Buffalo c.f. base plus c/l freight Buffalo to Massfield, Mass., f.o.b. Massfield; Empire Finished Steel Corp. on allocation outside New England, Buffalo c.f. base plus c/l freight Buffalo to plants f.o.b. plant; Compressed Steel Shafting Co. on allocation outside New England, Buffalo base plus c/l freight ville; Medart Co. in certain areas, Chi- Buffalo to Readville, Mass. f.o.b. Readcago c.f. base plus c/l freight Chicago to St. Louis, f.o.b. St. Louis.

Alloy Bars—Texas Steel Co. for delivery except Texas and Okla. Chicago base, f.o.b. Fort Worth, Tex.; Connors Steel Co. shipped outside Ala., Mississippi, Louisiana. Georgia, Florida, Tenn., Pittsburgh base, f.o.b. Birmingham.

Hot Rolled Strip—Joslyn Mfg. & Supply Co. $2.30 Chicago; Knoxville Iron Co. $2.25 basing pts.

Hot Rolled Sheets—Andrews Steel Co., Middletown base on shipments to Detroit or area; Parkersburg Iron & Steel Co., $2.25 Parkersburg.

Galvanized Sheets—Andrews Steel Co., $3.75 basing pts.; Parkersburg Iron & Steel Co. $3.85 Parkersburg; Apollo Steel Co. $3.75 basing pts.; Continental Steel Co., Middletown base on Kokomo, Ind., product; Superior Sheet Steel Co., Pittsburgh base except for Lend-Lease.

Pipe and Tubing—South Chester Tube Co. when priced at Pittsburgh, freight to Gulf Coast and Pacific Ports may be charged from Chester, Pa., also to points lying west of Harrisburg, Pa.

Black Sheets—Empire Sheet and Tinplate Co., maximum base price mill is $2.45 per 100 lb., with differentials, transportation charges, etc., provided in RPS. No. 6.

WAREHOUSE PRICES

Delivered metropolitan areas per 100 lb. These are zoned warehouse prices in conformance with latest zoning amendments to OPA Price Schedule 49.

Cities	SHEETS			STRIP		Plates ¼ in. and heavier	Structural Shapes	BARS		ALLOY BARS			
	Hot Rolled (10 gage)	Cold Rolled	Galvanized (24 gage)	Hot Rolled	Cold Rolled			Hot Rolled	Cold Finished	Hot Rolled, NE 8617-20	Hot Rolled, NE 9442-45 Ann.	Cold Drawn, NE 8617-20	Cold Drawn, NE 9442-45 Ann.
**Philadelphia	3.518	4.872[8]	5.018[a]	3.922	4.772	3.605	3.666	3.822	4.072	5.968	7.066	7.272	8.322
New York	3.590	4.613[3]	5.010	3.974[6]	4.772	3.768	3.758	3.853	4.103	6.008	7.108	7.303	8.353
Boston	3.744	4.744[9]	5.224[9]	4.106	4.715	3.912	3.912	4.044	4.144	6.162	7.262	7.344	8.394
Baltimore	3.394	4.852	4.894	3.902	4.752	3.594	3.759	3.802	4.052	....	....	....	....
Norfolk	3.771	4.965	5.371	4.165	4.865	3.971	4.002	4.065	4.165	....	....	....	....
Chicago	3.25	4.20	5.231	3.60	4.65[17]	3.55	3.55	3.50	3.75	5.75	6.85	6.85	7.90
Milwaukee	3.387	4.337[3]	5.272[4]	3.737	4.787[17]	3.687	3.687	3.637	3.887	5.987	7.087	7.087	8.137
Cleveland	3.35	4.40	4.877[4]	3.60	4.45	3.40	3.588	3.35	3.75	5.956	7.056	6.85	7.90
Buffalo	3.35	4.40	4.754	3.819	4.669	3.63	3.40	3.35	3.75	5.75	6.85	6.85	7.90
Detroit	3.45	4.50	5.004	3.70	4.659[17]	3.609	3.661	3.45	3.80	6.08	7.18	7.159	8.209
Cincinnati	3.425	4.475[3]	4.825[5]	3.675	4.711	3.611	3.691	3.611	4.011	....	....	....	....
St. Louis	3.397	4.347[3]	5.172[4]	3.747	4.931[17]	3.697	3.697	3.647	4.031	6.131	7.231	7.231	8.281
Pittsburgh	3.35	4.40	4.75	3.60	4.45	3.40	3.40	3.35	3.75	5.75	6.85	6.85	7.90
St. Paul	3.51	4.46	5.257[4]	3.86	4.35[17]	3.81[13]	3.81[13]	3.76[13]	4.361	6.09	7.19	7.561	8.711
Omaha	3.865	5.443	5.608[4]	4.215	....	4.165	4.165	4.115	4.43	....	....	....	....
Indianapolis	3.58	3.58	4.568	4.918	3.768	4.78	3.63	3.58	3.98	6.08	7.18	7.18	8.23
Birmingham	3.45	....	4.75	3.70	....	3.55	3.55	3.50	4.43	....	....	....	....
Memphis	3.965[7]	4.68	3.265	4.215	....	4.065	4.065	4.015	4.33	....	....	....	....
New Orleans	4.058*	4.95	5.358	4.308	....	4.158	4.158*	4.108*	4.629	....	....	....	....
Houston	3.763	5.573	6.313[1]	4.313	....	4.25	4.25	3.75	6.373[3]	7.223	8.323	8.323	9.373
Los Angeles	5.00	7.20[3]	6.10[4]	4.95	5.613[15]	4.95	4.65	4.40	5.583	8.304	9.404	9.404	10.454
San Francisco	4.55[14]	7.30[4]	6.35[4]	4.50[14]	7.333[17]	4.65[14]	4.35[14]	4.15[14]	5.333	8.304	9.404	9.404	10.454
Seattle	4.65[12]	7.05[4]	5.95[4]	4.25[12]	....	4.75[12]	4.45[12]	4.35[12]	5.783	....	9.404	....	....
Portland	4.65[11]	6.60[4]	5.75[4]	4.75[11]	....	4.75[11]	4.45[11]	4.45[11]	5.533	8.304	9.404	8.304	9.404
Salt Lake City	4.53[17]	....	6.17[18]	5.53[17]	....	4.98[17]	4.98[17]	4.88[17]	5.90	....	....	....	....

NATIONAL EMERGENCY (N. E.) STEELS

(Hot Rolled Mill Extras for Alloy Content)

Designation	CHEMICAL COMPOSITION LIMITS, PER CENT								Basic Open-Hearth		Electric Furnace	
	Carbon	Manganese	Phosphorus Max.	Sulphur Max.	Silicon	Chromium	Nickel	Molybdenum	Bars and Bar-Strip	Billets, Blooms and Slabs	Bars and Bar-Strip	Billets, Blooms and Slabs
NE 1330	.28/ .33	1.60/1.90	.040	.040	.20/ .35				.10c	$2.00		
NE 1335	.33/ .38	1.60/1.90	.040	.040	.20/ .35				.10	2.00		
NE 1340	.38/ .43	1.60/1.90	.040	.040	.20/ .35				.10	2.00		
NE 1345	.43/ .48	1.60/1.90	.040	.040	.20/ .35				.10	2.00		
NE 1350	.48/ .53	1.60/1.90	.040	.040	.20/ .35				.10	2.00		
NE 8613	.12/ .17	.70/ .90	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25c	$25.00
NE 8615	.13/ .18	.70/ .90	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8617	.15/ .20	.70/ .90	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8620	.18/ .23	.70/ .90	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8630	.28/ .33	.70/ .90	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8635	.33/ .38	.75/1.00	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8637	.35/ .40	.75/1.00	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8640	.38/ .43	.75/1.00	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8642	.40/ .45	.75/1.00	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8645	.43/ .48	.75/1.00	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8650	.48/ .53	.75/1.00	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8720	.18/ .23	.70/ .90	.040	.040	.20/ .35	.40/ .60	.40/ .70	.20/ .30	.80	16.00	1.30	26.00
NE 9255	.50/ .60	.70/ .95	.040	.040	1.80/2.20				.40	8.00		
NE 9260	.55/ .65	.70/1.00	.040	.040	1.80/2.20				.40	8.00		
NE 9261	.55/ .65	.70/1.00	.040	.040	1.80/2.20	.10/ .25			.65	13.00		
NE 9262	.55/ .65	.70/1.00	.040	.040	1.80/2.20	.25/ .40			.65	13.00		
NE 9415	.13/ .18	.80/1.10	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.75	15.00	1.25	25.00
NE 9420	.18/ .23	.80/1.10	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.75	15.00	1.25	25.00
NE 9422	.20/ .25	.80/1.10	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.75	15.00	1.25	25.00
NE 9425	.23/ .28	.80/1.10	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.75	15.00	1.25	25.00
NE 9430	.28/ .33	.90/1.20	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.75	15.00	1.25	25.00
NE 9435	.33/ .38	.90/1.20	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.75	15.00	1.25	25.00
NE 9437	.35/ .40	.90/1.20	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.75	15.00	1.25	25.00
NE 9440	.38/ .43	.90/1.20	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.75	15.00	1.25	25.00
NE 9442	.40/ .45	1.00/1.30	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.80	16.00	1.30	26.00
NE 9445	.43/ .48	1.00/1.30	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.80	16.00	1.30	26.00
NE 9450	.48/ .53	1.20/1.50	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.80	16.00	1.30	26.00
NE 9537*	.35/ .40	1.20/1.50	.040	.040	.40/ .60	.40/ .60	.40/ .70	.15/ .25	1.20	24.00	1.70	34.00
NE 9540*	.38/ .43	1.20/1.50	.040	.040	.40/ .60	.40/ .60	.40/ .70	.15/ .25	1.20	24.00	1.70	34.00
NE 9542*	.40/ .45	1.20/1.50	.040	.040	.40/ .60	.40/ .60	.40/ .70	.15/ .25	1.20	24.00	1.70	34.00
NE 9545*	.43/ .48	1.20/1.50	.040	.040	.40/ .60	.40/ .60	.40/ .70	.15/ .25	1.20	24.00	1.70	34.00
NE 9550*	.48/ .53	1.20/1.50	.040	.040	.40/ .60	.40/ .60	.40/ .70	.15/ .25	1.20	24.00	1.70	34.00

*Recommended for large sections only. Note: The extras shown are in addition to a base price of 2.70c. per 100 lb., on finished products and $54 per gross ton on semi-finished steel major basing points and are in cents per 100 lb. and dollars per gross ton in semi-finished. When acid open-hearth is specified and acceptable add to basic open hearth alloy differential 0.25c. per lb. for bars and bar strip, $5.00 per gross ton for billets, blooms and slabs. The ranges shown above are restricted to sizes 100 sq. in. or less or equivalent cross sectional area 18 in. wide or under with a max. individual piece weight of 7000 lb.

Base Quantities

Standard unless otherwise keyed on prices.

HOT ROLLED: Sheets, strip, plates, shapes and bars, 400 to 1999 lb.

COLD ROLLED: Sheets, 400 to 1499 lb.; strip, extras on all quantities; bars, 1500 lb. base; NE alloy bars, 1000 to 39,999 lb.

EXCEPTIONS: (1) 150 to 499 lb. (2) 150 to 1499 lb. (3) 400 to 1499 lb. (4) 450 to 1499 lb. (5) 500 to 1499 lb. (6) 0 to 1999 lb. (7) 400 to 1999 lb. (8) 1000 to 1999 lb. (9) 450 to 3749 lb. (10) 400 to 3999 lb. (11) 300 to 4999 lb. (12) 300 to 10,000 lb. (13) 400 to 14,999 lb. (14) 400 lb. and over. (15) 1000 lb. and over. (16) 1500 lb. and over. (17) 2000 lb. and over. (18) 3500 lb. and over.

(a) Philadelphia: Galvanized sheets, 25 or more bundles.

Extra for size, quality, etc., apply on above quotations.

*Add 0.271c. for sizes not rolled in Birmingham.

**City of Philadelphia only. Applicable freight rates must be added to basing point prices to obtain delivered price to other localities in metropolitan area.

LAKE SUPERIOR ORES

(51.50% *Fe, Natural Content, Delivered Lower Lake Ports**)

	Per Gross Ton
Old range, bessemer, 51.50	$4.75
Old range, non-bessemer, 51.50	4.60
Mesaba, bessemer, 51.50	4.60
Mesaba, non-bessemer, 51.50	4.45
High phosphorus, 51.50	4.35

*Adjustments are made to indicate prices based on variance of Fe content of ores as analyzed on a dry basis by independent laboratories.

FLUORSPAR

Maximum price, f.o.b. consumer's plant, $30 per short ton plus either (1) rail freight from producer to consumer, or (2) rail freight from Rosiclare, Ill., to consumer, whichever is lower.

Exception

When the WPB Steel Division certifies in writing the consumer's need for one of the higher grades of metallurgical fluorspar specified in the table below the price shall be taken from the table plus items (1 and 2) from paragraph above.

Effective CaF_2 Content:	*Base price per short ton*
70% or more	$33.00
65% but less than 70%	32.00
60% but less than 65%	31.00
Less than 60%	30.00

PRICES

SEMI-FINISHED STEEL

Ingots, Carbon, Rerolling

Base per gross ton, f.o.b. mill.... $31.00
Exceptions: Phoenix Iron Co. may charge $38.75; Kaiser Co., $43.00 f.o.b. Pacific Coast Ports; Empire Sheet & Tinplate Co., $34.25.

Ingots, Carbon, Forging

Base per gross ton, f.o.b. Birmingham, Buffalo, Chicago, Cleveland, Gary, Pittsburgh, Youngstown $36.00
Exceptions: Phoenix Iron Co. may charge $43.00; Empire Sheet & Tinplate Co., $39.25, f.o.b. Mansfield, Ohio; West Coast producers, $48.00, f.o.b. Pacific Coast Ports.

Ingots, Alloy

Base per gross ton, f.o.b. Bethlehem, Buffalo, Canton, Coatesville, Chicago, Massillon, Pittsburgh $45.00
Exceptions: C/L delivered Detroit add $2.00; delivered East Michigan add $3.00. Connors Steel Co. may charge $45.00 f.o.b. Birmingham.

Billets, Blooms and Slabs

Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham, Sparrows Point (rerolling only). Prices delivered Detroit are $2.00 higher; delivered E. Michigan, $3 higher; f.o.b. Duluth, billets only, $2.00 higher; billets f.o.b. Pacific ports are $12 higher. Provo, $11.20 higher. Delivered prices do not reflect three per cent tax on freight rates.

	Per Gross Ton
Rerolling	$34.00
Forging quality	40.00

For exceptions on semi-finished steel see the footnote on the page of finished steel prices.

Alloy Billets, Blooms, Slabs

Pittsburgh, Chicago, Canton, Massillon, Buffalo, or. Bethlehem, per gross ton 54.00
Price delivered Detroit $2.00 higher; E. Michigan $3.00 higher.

Shell Steel

	Per Gross Ton
3 in. to 12 in.	$52.00
12 in. to 18 in.	54.00
18 in. and over	56.00

Basic open hearth shell steel, f.o.b. Pittsburgh, Chicago, Buffalo, Gary, Cleveland, Youngstown and Birmingham.
Prices delivered Detroit are $2.00 higher; E. Michigan, $3 higher.
Note: The above base prices apply on lots of 1000 tons of a size and section to which are to be added extras for chemical requirements, cutting, or quantity.

Sheet Bars

Pittsburgh, Chicago, Cleveland, Youngstown, Buffalo, Canton, Sparrows Point.

	Per Gross Ton
Open hearth or bessemer	$34.00

Skelp

Pittsburgh, Chicago, Youngstown, Coatesville, Pa., Sparrows Point, Md.

	Per Lb.
Grooved, universal and sheared	1.90c.

Wire Rods

(*No. 5 to 9/32 in.*)

	Per Lb.
Pittsburgh, Chicago, Cleveland	2.00c.
Worcester, Mass.	2.10c.
Birmingham	2.00c.
San Francisco	2.50c.
Galveston	2.25c.

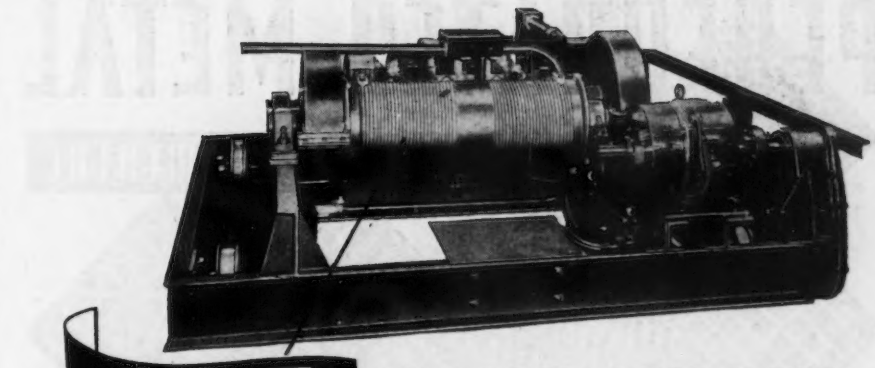
9/32 in. to 47/64 in., 0.15c. a lb. higher. Quantity extras apply.

TOOL STEEL

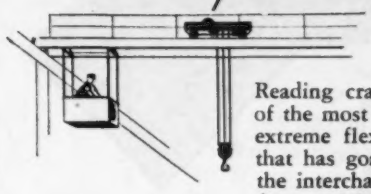
(*F.o.b. Pittsburgh, Bethlehem, Syracuse*)

	Base per lb.
High speed	67c.
Straight molybdenum	54c.
Tungsten-molybdenum	57½c.
High-carbon-chromium	43c.
Oil hardening	24c.
Special carbon	22c.
Extra carbon	18c.
Regular carbon	14c.

Warehouse prices east of Mississippi are 2c. a lb. higher; west of Mississippi 3c. higher.



SAVE ON FIRST COST WITH READING UNIT CRANE DESIGN



Reading cranes can be fitted exactly to the requirements of the most difficult materials handling job because of the extreme flexibility of their unit design. The engineering that has gone into the simple, accessible arrangement and the interchangeable parts of the crane, eliminates the need for special design work on every job.

This means you get a crane that meets your requirements exactly without any extra design costs. You save in first cost, and you get exactly the performance needed by the job. For complete information write for "The Why and How of Faster Production."

READING CHAIN HOISTS-ELECTRIC HOISTS OVERHEAD TRAVELING CRANES

READING CHAIN & BLOCK CORP. 2101 ADAMS ST., READING, PA.

"HERCULES" REG. U.S. PAT. OFF. RED-STRAND WIRE ROPE

You Can Depend On "Hercules" (Red Strand) Wire Rope

Highlights of Quality

1. Acid Open-Hearth Steel Wire
2. Rigid Tests and Inspections
3. Correct Manufacturing Methods
4. Furnished in both the Round and Flattened Strand constructions, in either Standard or Preformed Type.

• • Results are what count, and the performance record of this wire rope continues to make and hold friends.

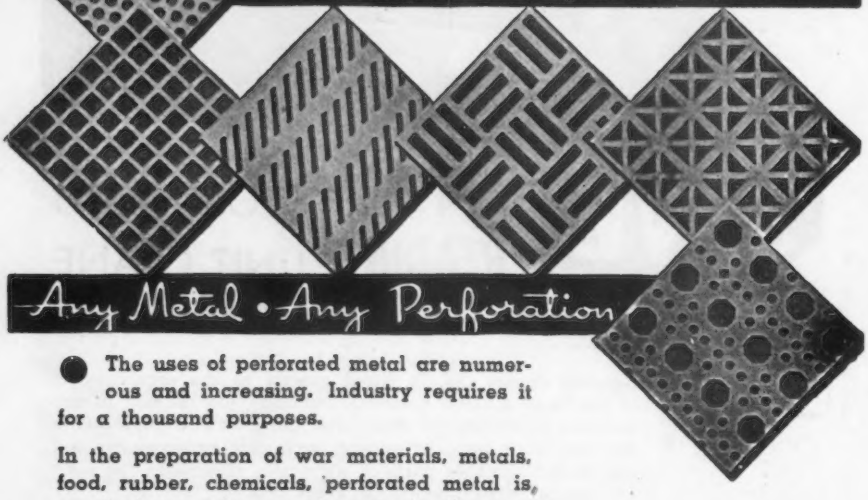
There is no guess work when you use "HERCULES" (Red-Strand) Wire Rope. It is designed and built to do specific jobs better . . . safer . . . more economically. If you will tell us how you use wire rope, we shall be glad to suggest the construction and type most suitable for your conditions.

MADE ONLY BY
A. LESCHEN & SONS ROPE CO.
WIRE ROPE MAKERS — ESTABLISHED 1857
5909 KENNERLY AVENUE — ST. LOUIS, MISSOURI, U.S.A.

NEW YORK • • • 90 West Street
CHICAGO • • 810 W. Washington Blvd.
DENVER • • • 1554 Wazee Street
SAN FRANCISCO • • 320 Fourth Street
PORTLAND • • 914 N. W. 14th Avenue
SEATTLE • • 3410 First Avenue South

PERFORATED METAL

INDUSTRIAL and ORNAMENTAL



Any Metal • Any Perforation

● The uses of perforated metal are numerous and increasing. Industry requires it for a thousand purposes.

In the preparation of war materials, metals, food, rubber, chemicals, perforated metal is required to perform an important role.

The Harrington & King PERFORATING Co.

5657 FILLMORE STREET—CHICAGO 44, ILL.
Eastern Office, 114 Liberty Street, New York 6, N. Y.

Under constant laboratory control from original steel to finished product... produced by wire drawers of long experience in high quality products.

Stock sizes .003" to .200" dia. In coils or packages.

Stocks in Worcester, Akron, Atlanta, Chicago, Los Angeles

JOHNSON STEEL & WIRE CO., INC.
WORCESTER 1, MASSACHUSETTS.
NEW YORK ATLANTA AKRON CHICAGO LOS ANGELES

PRICES

WELDED PIPE AND TUBING

Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio, Mills

(F.o.b. Pittsburgh only on wrought pipe)
Base Price—$2.00 per Net Ton

	Black	Galv.
Steel (Butt Weld)		
½ in.	63½	51
¾ in.	66½	55
1 to 3 in.	68½	57½
Wrought Iron (Butt Weld)		
½ in.	24	3½
¾ in.	30	10
1 and 1¼ in.	34	16
1½ in.	38	18½
2 in.	37½	18
Steel (Lap Weld)		
2 in.	61	49½
2½ and 3 in.	64	52½
3½ to 6 in.	66	54½
Wrought Iron (Lap Weld)		
2 in.	30½	12
2½ to 3½ in.	31½	14½
4 in.	33½	18
4½ to 8 in.	32½	17
Steel (Butt, extra strong, plain ends)		
½ in.	61½	50½
¾ in.	65½	54½
1 to 3 in.	67	57
Wrought Iron (Same as Above)		
½ in.	25	6
¾ in.	31	12
1 to 2 in.	38	19½
Steel (Lap, extra strong, plain ends)		
2 in.	59	48½
2½ and 3 in.	63	52½
3½ to 6 in.	66½	56
Wrought Iron (Same as Above)		
2 in.	33½	15½
2½ to 4 in.	39	22½
4½ to 6 in.	37½	21

On butt weld and lap weld steel pipe jobbers are granted a discount of 5%. On less-than-carload shipments prices are determined by adding 25 and 30% and the carload freight rate to the base card.

F.o.b. Gary prices are two points lower discount or $4 a ton higher than Pittsburgh or Lorain on lap weld and one point lower discount, or $2 a ton higher on all butt weld.

CAST IRON WATER PIPE

Per Net Ton

6-in. and larger, del'd Chicago....$54.80
6-in. and larger, del'd New York... 52.20
6-in. and larger, Birmingham 46.00
6-in. and larger f.o.b. cars, San Francisco or Los Angeles 69.40
6-in. and larger f.o.b. cars, Seattle. 71.20

Class "A" and gas pipe, $3 extra; 4-in. pipe is $3 a ton above 6-in. Prices shown are for lots of less than 200 tons. For 200 tons or over, 6-in. and larger are $45 at Birmingham and $53.80 delivered Chicago, $59.40 at San Francisco and Los Angeles, and $70.20 at Seattle. Delivered prices do not reflect new 3 per cent tax on freight rates.

BOILER TUBES

Seamless Steel and Lap Weld Commercial Boiler Tubes and Locomotive Tubes. Minimum Wall. Net base prices per 100 ft. f.o.b. Pittsburgh, in carload lots.

	Seamless Cold Drawn	Hot Rolled	Lap Weld. Hot Rolled
2 in. o.d. 13 B.W.G.	15.03	13.04	12.38
2½ in. o.d. 12 B.W.G.	20.21	17.54	16.65
3 in. o.d. 12 B.W.G.	22.48	19.50	18.52
3½ in. o.d. 11 B.W.G.	28.37	24.62	23.15
4 in. o.d. 10 B.W.G.	35.20	30.54	28.66

(Extras for less carload quantities)

40,000 lb. or ft., and over.....Base
30,000 lb. or ft. to 39,999 lb. or ft. 5%
20,000 lb. or ft. to 29,999 lb. or ft. 10%
10,000 lb. or ft. to 19,999 lb. or ft. 20%
5,000 lb. or ft. to 9,999 lb. or ft. 30%
2,000 lb. or ft. to 4,999 lb. or ft. 45%
Under 2,000 lb. or ft..... 65%

PRICES

WIRE PRODUCTS

To the trade, f.o.b. Pittsburgh, Chicago, Cleveland, Birmingham, Duluth

	Basing Points Named	Pacific Coast Basing Points†
	Base per Keg	
Standard wire nails	$2.55	$3.05
Coated nails	2.55	3.05
Cut nails, carloads	3.85	....
	Base per 100 l.b.	
Annealed fence wire	$3.05	$3.55
Annealed galv. fence wire	3.40	3.90
	Base Column	
Woven wire fence*	$0.67	$0.85
Fence posts, carloads	.69	.86
Single loop bale ties	.59	.84
Galvanized barbed wire**	.70	.80
Twisted barbless wire	.70	....

*15½ gage and heavier. **On 80-rod spools in carload quantities.
†Prices subject to switching or transportation charges.

BOLTS, NUTS, RIVETS, SET SCREWS

Bolts and Nuts
(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)

Machine and Carriage Bolts:
Base discount less case lots

	Per Cent Off List
½ in. & smaller x 6 in. & shorter	65½
9/16 & ⅝ in. x 6 in. & shorter	63½
¾ to 1 in. x 6 in. & shorter	61
1⅛ in. and larger, all lengths	59
All diameters over 6 in. long	59
Lag, all sizes	62
Plow bolts	65

Nuts, Cold Punched or Hot Pressed:
(Hexagon or Square)

½ in. and smaller	62
9/16 to 1 in. inclusive	59
1⅛ to 1½ in. inclusive	57
1⅝ in. and larger	56

On above bolts and nuts, excepting plow bolts, additional allowance of 10 per cent for full container quantities. There is an additional 5 per cent allowance for carload shipments.

Semi-Fin. Hexagon Nuts	U.S.S.	S.A.E.
Base discount less keg lots		
7/16 in. and smaller	..	64
½ in. and smaller	62	..
⅝ in. through 1 in.	..	60
9/16 in. to 1 in.	59	..
1⅛ in. through 1½ in.	57	58
1⅝ in. and larger	56	

In full keg lots, 10 per cent additional discount.

Stove Bolts	*Consumer*
Packages, nuts loose	71 and 10
In packages, with nuts attached	71
In bulk	80

On stove bolts freight allowed up to 65c. per 100 lb. based on Cleveland Chicago, New York on lots of 200 lb. or over.

Large Rivets (½ in. and larger)	*Base per 100 lb.*
F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham	$3.75

Small Rivets (7/16 in. and smaller)	*Per Cent Off List*
F.o.b. Pittsburgh, Cleveland Chicago, Birmingham	65 and 5

Cap and Set Screws	*Consumer Per Cent Off List*
Upset full fin. hexagon head cap screws, coarse or fine thread, up to and incl. 1 in. x 6 in.	64
Upset set screws, cup and oval points	71
Milled studs	46
Flat head cap screws, listed sizes	36
Fillister head cap, listed sizes	51

Freight allowed up to 65c. per 100 lb. based on Cleveland, Chicago or New York on lots of 200 lb. or over.

ROOFING TERNE PLATE
(F.o.b. Pittsburgh, 112 Sheets)

	20x14 in.	20x28 in.
8-lb. coating I.C.	$6.00	$12.00
15-lb. coating I.C.	7.00	14.00
30-lb. coating I.C.	7.50	15.00

Just check this list

For information on pneumatic and hydraulic production equipment

- Hydraulic Presses, Bulletin 60
- Pneumatic Cylinders and Air Control Valves, Bulletin 57
- Hydraulic Cylinders, Bulletin 35
- Pneumatic Arbor Presses, Bulletin 46
- Centrifugal Quenching Press, Bulletin 55
- "Allen" Pneumatic Riveters, Bulletin 43
- "Hy-Power" Hydraulic Riveters, Bulletin 53
- Air Pressure Regulating Valves, Bulletin 56
- Pneumatic Vises, Bulletin 59

You will find helpful data in these bulletins. Any or all of them will be sent on request.

HANNIFIN
MANUFACTURING COMPANY
623 South Kolmar Avenue • Chicago 24, Illinois

"100%" ... that's what many people call the springs we make ... including a certain branch of our military forces. Sometimes we may drop to 99% ... or possibly a little less ... but then we're only 99 years old ... and we've got a lot to learn ... but we'll keep trying because we want to be

"Everybody's Spring Dept."

DUNBAR
BROTHERS CO.
DIV. OF ASSOCIATED SPRING CORP.
BRISTOL, CONN.

SPRINGS · WIRE FORMS · SMALL STAMPINGS

PIG IRON

All prices set in bold face type are maxima established by OPA on June 24, 1941. Other domestic prices (in italics) are delivered quotations per gross ton computed on the basis of the official maxima. Delivered prices do not reflect 3 per cent tax on freight rates.

	No. 2 Foundry	Basic	Bessemer	Malleable	Low Phosphorus	Charcoal
Boston	*$25.50*	*$25.00*	*$26.50*	*$26.00*	.....	.....
Brooklyn	*27.50*	*27.00*		*28.00*	.....	.....
Jersey City	*26.53*	*26.03*	*27.53*	*27.03*	.....	.....
Philadelphia (4)	*25.84*	*25.34*	*26.84*	*26.34*	*$30.74*	.....
Bethlehem, Pa.	25.00	24.50	26.00	25.50	.....	.....
Everett, Mass.	25.00	24.50	26.00	25.50	.....	.....
Swedeland, Pa.	25.00	24.50	26.00	25.50	.....	.....
Steelton, Pa.		24.50			29.50	.....
Birdsboro, Pa. (3)	25.00	24.50	26.00	25.50	29.50	.....
Sparrows Point, Md.	25.00	24.50			.....	.....
Erie, Pa.	24.00	23.50	25.00	24.50	.....	.....
Neville Island, Pa.	24.00	23.50	24.50	24.00	.....	.....
Sharpsville, Pa. (1)	24.00	23.50	24.50	24.00	.....	.....
Buffalo	24.00	23.00	25.00	24.50	29.50	.....
Cincinnati, Ohio	*25.11*	*24.61*		*25.11*	.....	.....
Canton, Ohio	*25.39*	*24.89*	*25.89*	*25.39*	*32.69*	.....
Mansfield, Ohio	*25.94*	*25.44*	*26.44*	*25.94*	*32.86*	.....
St. Louis	*24.50*	*24.50*	.....	.....	.....	.....
Chicago	24.00	23.50	24.50	24.00	*35.46*	*$37.34*
Granite City, Ill.	24.00	23.50	24.50	24.00	.....	.....
Cleveland	24.00	23.50	24.50	24.00	*32.42*	.....
Hamilton, Ohio	24.00	23.50		24.00	.....	.....
Toledo	24.00	23.50	24.50	24.00	.....	.....
Youngstown	24.00	23.50	24.50	24.00	*32.42*	.....
Detroit	24.00	23.50	24.50	24.00	.....	.....
Lake Superior fc.	.....	.....	.....	.....	.....	34.00
Lyles, Tenn. fc. (2)	.....	.....	.....	.....	.....	33.00
St. Paul	*26.63*	26.13	*27.13*	*26.63*	*39.80*	.....
Duluth	24.50	24.00	25.00	24.50	.....	.....
Birmingham	20.38	19.00	25.00	.....	.....	.....
Los Angeles	*26.95*	.....	.....	.....	.....	.....
San Francisco	*26.95*	.....	.....	.....	.....	.....
Seattle	*26.95*	.....	.....	.....	.....	.....
Provo, Utah	22.00	21.50	.....	.....	.....	.....
Montreal	*27.50*	*27.50*	.....	*28.00*	.....	.....
Toronto	*25.50*	*25.50*	.....	*26.00*	.....	.....

(1) Pittsburgh Coke & Iron Co. (Sharpsville, Pa., furnace only) and the Struthers Iron and Steel Co., Struthers, Ohio, may charge 50c. a ton in excess of basing point prices for No. 2 foundry, basic, bessemer and malleable. Struthers Iron and Steel Co. may add another $1.00 per gross ton for iron from Struthers, Ohio, plant.

(2) Price shown is for low-phosphorous iron; high phosphorous sells for $28.50 at the furnace.

(3) E. & G. Brooke Co. Birdsboro, Pa., permitted to charge $1.00 per ton extra.

(4) Pittsburgh Ferromanganese Co. (Chester furnace only) may charge $2.25 a ton over maximum basing point prices.

Basing point prices are subject to switching charges; Silicon differentials (not to exceed 50c. a ton for each 0.25 per cent silicon content in excess of base grade which is 1.75 to 2.25 per cent); Phosphorus differentials, a reduction of 38c. per ton for phosphorus content of 0.70 per cent and over; Manganese differentials, a charge not to exceed 50c. per ton for each 0.50 per cent manganese content in excess of 1.00 per cent. Effective March 3, 1943, $2 per ton extra may be charged for 0.5 to 0.75 per cent nickel content and $1 per ton extra for each additional 0.25 per cent nickel.

"BAY FORGE IRON" Valley or Pittsburgh furnace $23.50

METAL POWDERS

Prices are based on current market prices of ingots plus a fixed figure. F.o.b. shipping point, c. per lb., ton lots.

Copper, electrolytic, 150 and 200 mesh	21⅛ to 23½c.
Copper, reduced, 150 and 200 mesh	20½ to 25½c.
Iron, commercial, 100 and 200 mesh, 96 + % Fe	13½ to 15c.
Iron, crushed, 200 mesh and finer, 90 + % Fe	4c.
Iron, hydrogen reduced, 300 mesh and finer, 98½ + % Fe	63c.
Iron, electrolytic, unannealed, 300 mesh and coarser, 99 + % Fe	30 to 33c.
Iron, electrolytic, annealed minus 100 mesh, 99 + % Fe	42c.
Iron, carbonyl, 300 mesh and finer, 98-99.8 + % Fe	90c.
Aluminum, 100 and 200 mesh	*23 to 27c.
Antimony, 100 mesh	20.6c.
Cadmium, 100 mesh	$1
Chromium, 150 mesh	$1.03
Lead, 100, 200 & 300 mesh, 11½ to 12½c.	
Manganese, 150 mesh	51c.
Nickel, 150 mesh	51½c.
Solder powder, 100 mesh, 8½c. plus metal	
Tin, 100 mesh	58¾c.
Tungsten metal powder, 98%-99%, any quantity, per lb.	$2.60
Molybdenum power, 99%, in 200-lb. kegs, f.o.b. York, Pa., per lb.	$2.60
Under 100 lb.	$3.00

*Freight allowed east of Mississippi.

COKE

Furnace, beehive (f.o.b. oven)	Net Ton
Connellsville, Pa.	$7.00*
Foundry, beehive (f.o.b. oven)	
Fayette Co., W. Va.	8.10
Connellsville, Pa.	8.25
Foundry, By-Product	
Chicago, del'd	13.35
Chicago, f.o.b.	12.60
New England, del'd	14.25
Kearny, N. J., f.o.b.	12.65
Philadelphia, del'd	12.88
Buffalo, del'd	13.00
Portsmouth, Ohio, f.o.b.	11.10
Painesville, Ohio, f.o.b.	11.75
Erie, del'd	12.75
Cleveland, del'd	12.80
Cincinnati, del'd	12.85
St. Louis, del'd	13.85
Birmingham, del'd	10.50

*Hand drawn ovens using trucked coal permitted to charge $7.75 per ton plus transportation charges. **Mo., Ala., and Tenn. producers—$13.35.

C-F POSITIONERS

Faster, Better, Safer Welding

And more economical too, with C-F Positioners. Permit downhand welding of top, bottom and sides with a single set-up—more uniformly perfect joints, better fillets and beads. Eliminate frequent crane-lifts, save crane-operator and sling crew time. There's a model for every need—from small, hand-operated types to giants that handle 30,000. lbs. weldments. C-F Positioners revolve a full 360°, tilt to 135° beyond horizontal. Table rotation from 0 R.P.M. up, for automatic welding. They are universal tools, adjustable for height—pedestal or boom mounted to give maximum floor and working clearance.

Write for Bulletin WP-22

CULLEN-FRIESTEDT CO.

1303 S. Kilbourn Ave., Chicago 23, Ill.

PRICES

REFRACTORIES
(F.o.b. Works)

Fire Clay Brick	*Per 1000*
Super-duty brick, St. Louis	$64.60
First quality, Pa., Md., Ky., Mo., Ill.	51.30
First quality, New Jersey	56.00
Sec. quality, Pa., Md., Ky., Mo., Ill.	46.55
Second quality, New Jersey	51.00
No. 1, Ohio	43.00
Ground fire clay, net ton	7.60
Silica Brick	
Pennsylvania and Birmingham	$51.30
Chicago District	58.90
Silica cement, net ton (Eastern)	9.00
Chrome Brick	*Per Net Ton*
Standard chemically bonded, Balt., Plymouth Meeting, Chester	$54.00
Magnesite Brick	
Standard, Balt. and Chester	$76.00
Chemically bonded, Baltimore	65.00
Grain Magnesite	
Domestic, f.o.b. Balt. and Chester in sacks (carloads)	$43.48
Domestic, f.o.b. Chewelah, Wash. (in bulk)	22.00

RAILS, TRACK SUPPLIES
(F.o.b. Mill)

Standard rails, heavier than 60 lb., No. 1 O.H., gross ton	$40.00
Angle splice bars, 100 lb.	2.70
(F.o.b. Basing Points)	*Per Gross Ton*
Light rails (from billets)	$40.00
Light rails (from rail steel)	39.00
	Base per Lb.
Cut spikes	3.00c.
Screw spikes	5.15c.
Tie plates, steel	2.15c.
Tie plates, Pacific Coast	2.30c.
Track bolts	4.75c.
Track bolts, heat treated, to railroads	5.00c.
Track bolts, jobbers discount	63-5

Basing points, light rails, Pittsburgh, Chicago, Birmingham; cut spikes and tie plates—Pittsburgh, Chicago, Portsmouth, Ohio, Weirton, W. Va., St. Louis, Kansas City, Minnequa, Colo., Birmingham and Pacific Coast ports; tie plates alone—Steelton, Pa., Buffalo. Cut spikes alone—Youngstown, Lebanon, Pa., Richmond, Oregon and Washington ports, add 25c.

CORROSION AND HEAT-RESISTING STEEL
(Per lb. base price, f.o.b. Pittsburgh)

Chromium-Nickel Alloys	No. 304	No. 302
Forging billets	21.25c.	20.40c.
Bars	25.00c.	24.00c.
Plates	29.00c.	27.00c.
Structural shapes	25.00c.	24.00c.
Sheets	36.00c.	34.00c.
Hot rolled strip	23.50c.	21.50c.
Cold rolled strip	30.00c.	28.00c.
Drawn wire	25.00c.	24.00c.

Straight-Chromium Alloys	No. 410	No. 430	No. 442	No. 446
F.Billets	15.725c.	16.15c.	19.125c.	23.375c.
Bars	18.50c.	19.00c.	22.50c.	27.50c.
Plates	21.50c.	22.00c.	25.50c.	30.50c.
Sheets	26.50c.	29.00c.	32.50c.	36.50c.
Hot strip	17.00c.	17.50c.	24.00c.	35.00c.
Cold strip	22.00c.	22.50c.	32.00c.	52.00c.

Chromium-Nickel Clad Steel (20%)	No. 304
Plates	18.00c.*
Sheets	19.00c.

*Includes annealing and pickling.

ELECTRICAL SHEETS
(Base, f.o.b. Pittsburgh)

	Per Lb.
Field grade	3.20c.
Armature	3.55c.
Electrical	4.05c.
Motor	4.95c.
Dynamo	5.65c.
Transformer 72	6.15c.
Transformer 65	7.15c.
Transformer 58	7.65c.
Transformer 52	8.45c.

F.o.b. Granite City, add 10c. per 100 lb. on field grade to and including dynamo. Pacific ports add 75c. per 100 lb. on all grades.

True fitting in particular jobs assured with *CLEVELAND* FLAT HEAD CAP SCREWS

• • Uniform lead on thread—clean slotting — chamfered point. Fully machined. All sizes, standard threads • • Write for samples and prices.

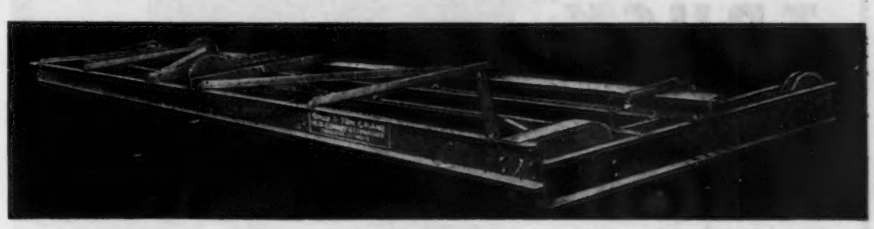
CLEVELAND FASTENERS

The Cleveland Cap Screw Company
2917 EAST 79TH STREET • CLEVELAND 4, OHIO
Warehouses: Chicago, Philadelphia, New York, Los Angeles

MADE BY THE ORIGINATORS OF THE KAUFMAN PROCESS FOR GREATER STRENGTH AND ACCURACY

CONCO 3-Motor Single Girder CAB OR FLOOR OPERATED

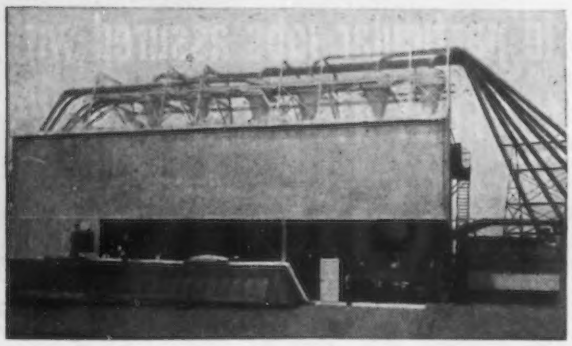
ELECTRIC CRANE . . .



● Available in capacities of one through five tons for floor or cab operation. Simply, ruggedly designed for low first cost and maintenance. Used with Low Headroom Type Hoist, provides for maximum space coverage horizontally and vertically. Effective in even a minimum space. Write for Bulletin 2000.

Write for Bulletin 26000 describing the Torpedo Hoist shown. Three capacities 250 lb. — $139.50, 500 lb. — $149.50, 1000 lb. — $159.50. Heavily, simply built, with Push Button Control. Outstanding in CONCO'S complete line of hand-powered and electric Cranes, Hoists, Trolleys.

CONCO ENGINEERING WORKS
M. D. Conkey & Co. — 15 Grove St. — Mendota, Ill.
Builders Of Conco Torpedo Electric Hoist



CORK STORAGE BINS, 18 hoppers of No. 10 ga. steel, kept weather proof by a 54'x81'x30' corrugated enclosure . . . System, including structural supports and conveyor ducts designed, fabricated and erected by Brandt.

Big Installations or Small Parts—

Call **BRANDT of Baltimore**

for Precision in Heavy Plate and Sheet Steel Work

Here is an 8½ acre plant . . . with the most modern equipment for shearing, rolling, forming, welding and completely fabricating ferrous, non-ferrous and alloy metals to your specifications . . . from the lightest gauge up to and including 1¼" mild steel or ¾" armor plate. Extensive war contracts necessarily limit our present acceptance of new business for immediate delivery. For information, address: Charles T. Brandt, Inc., Baltimore-30, Maryland.

BRANDT of Baltimore—*Craftsmen in Metal Since 1890*

Move it with a **FORK TRUCK**

A NATION of highly skilled workers making products of precision quality on a mass-production scale —is an ideal post-war America.

Train unskilled workers to be skilled workers —starting now.

One trained man using a Clark Fork Truck does the work of ten unskilled workers.

"Unskilled labor adds nothing to a product except cost."

CLARK TRUCTRACTOR

BATTLE CREEK, MICHIGAN, U.S.A.

PRICES

Ferromanganese

78-82% Mn, maximum contract base price per gross ton, lump size, f.o.b. car at Baltimore, Bethlehem, Philadelphia, New York, Birmingham, Rockdale, Rockwood, Tenn.

Carload lots (bulk)	$135.00
Carload lots (packed)	141.00
Less ton lots (packed)	148.50

Premium, $1.70 for each 1% above 82% Mn; penalty, $1.70 for each 1% below 78%.

Manganese Metal

Contract basis, lump size, per lb. of metal, f.o.b. shipping point with freight allowed. Spot sales add 2c. per lb.

96-98% Mn, .2% max. C, 1% max. Si, 2% max. Fe.

Carload, bulk	36c.
L.c.l. lots	38c.

95-97% Mn, .2% max. C, 1.5% max. Si, 2.5% max. Fe.

Carload, bulk	34c.
L.c.l. lots	35c.

Spiegeleisen

Maximum base, contract prices, per gross ton, lump, f.o.b. Palmerton, Pa.

	16-19% Mn 3% max. Si	19-21% Mn 3% max. Si
Carloads	$35.00	$36.00
Less ton	47.50	48.50

Electric Ferrosilicon

OPA maximum base price cents per lb. contained Si, lump size in carlots, f.o.b. shipping point with freight allowed to destination.

	Eastern Zone	Central Zone	Western Zone
50% Si	6.65c.	7.10c.	7.25c.
75% Si	8.05c.	8.20c.	8.75c.
80-90% Si	8.90c.	9.05c.	9.55c.
90-95% Si	11.05c.	11.20c.	11.65c.

Spot sales add: .45c. per lb. for 50% Si, .3c. per lb. or 75% Si .25c. per lb. for 80-90% and 90-95% Si.

Silvery Iron

(Per Gross Ton, base 6.00 to 6.50 Si)

F.o.b. Jackson, Ohio	$29.50*
Buffalo	30.75*

For each additional 0.50% silicon add $1 a ton. For each 0.50% manganese over 1% add 50c. a ton. Add $1 a ton for 0.75% phosphoros or over.

*OPA price established 6-24-41.

Bessemer Ferrosilicon

Prices are $1 a ton above silvery iron quotations of comparable analysis.

Silicon Metal

OPA maximum base price per lb. of contained Si, lump size, f.o.b. shipping point with freight allowed to destination, for l.c.l. above 2000 lb., packed. Add .25c. for spot sales.

	Eastern Zone	Central Zone	Western Zone
96% Si, 2% Fe.	13.10c.	13.55c.	16.50c.
97% Si, 1% Fe.	13.45c.	13.90c.	16.80c.

Ferrosilicon Briquets

OPA maximum base price per lb. of briquet, bulk, f.o.b. shipping point with freight allowed to destination. Approximately 40% Si. Add .25c. for spot sales.

	Eastern Zone	Central Zone	Western Zone
Carload, bulk	3.35c.	3.50c.	3.65c.
2000 lb.-carload	3.8c.	4.2c.	4.25c.

Silicomanganese

Contract basis lump size, per lb. of metal, f.o.b. shipping point with freight allowed. Add .25c. for spot sales. 65-70% Mn, 17-20% Si, 1.5% max. C.

Carload, bulk	6.05c.
2000 lb. to carload	6.70c.
Under 2000 lb.	6.90c.
Briquets, contract, basis carlots, bulk freight allowed, per lb.	5.80c.
2000 lb. to carload	6.30c.
Less ton lots	6.55c.

Ferrochrome

(65-72% Cr, 2% max. Si)

OPA maximum base contract prices per lb. of contained Cr, lump size in carload lots, f.o.b. shipping point, freight allowed to destination. Add .25c. per lb. contained Cr for spot sales.

	Eastern Zone	Central Zone	Western Zone
0.06% C	23.00c.	23.40c.	24.00c.
0.10% C	22.50c.	22.90c.	23.50c.
0.15% C	22.00c.	22.40c.	23.00c.
0.20% C	21.50c.	21.90c.	22.50c.
0.50% C	21.00c.	21.40c.	22.00c.
1.00% C	20.50c.	20.90c.	21.50c.
2.00% C	19.50c.	19.90c.	21.00c.
66-71% Cr, 4-10% C	13.00c.	13.40c.	14.00c.

Other Ferroalloys

Ferrotungsten, Standard grade, lump or ¼ X down, packed, f.o.b. plant at Niagara Falls, New York, Washington, Pa., York, Pa., per lb. contained tungsten, 10,000 lb. or more... $1.90

Ferrovanadium, 35-55%, contract basis, f.o.b. producer's plant, usual freight allowances, per usual freight allowances, per lb. contained Va.
- Open Hearth $2.70
- Crucible $2.80
- Primos $2.90

Cobalt, 97% min., keg packed, contract basis, f.o.b. producer's plant, usual freight allowances, per lb. of cobalt metal $1.50

Vanadium pentoxide, 88%-92% V_2O_5 technical grade, contract basis, any quantity, per lb. contained V_2O_5. Spot sales add 5c. per lb. contained V_2O_5 ..... $1.10

Ferroboron, contract basis, 17.50% min. Bo, f.o.b. producer's plant with usual freight allowances, per lb. of alloy.
- 2000 lb. to carload $1.20
- Under 2000 lb. 1.30

Silcaz No. 3, contract basis, f.o.b. producer's plant with usual freight allowances, per lb. of alloy. (Pending OPA approval)
- Carload lots ..... 25c.
- 2000 lb. to carload ..... 26c.

Silvaz No. 3, contract basis, f.o.b. producer's plant with freight allowances, per lb. of alloy (Pending OPA approval)
- Carload lots ..... 58c.
- 2000 lb. to carload ..... 59c.

Grainal, f.o.b. Bridgeville, Pa., freight allowed 50 lb. and over, max. based on rate to St. Louis
- No. 1 ..... 87.5c.
- No. 6 ..... 60c.
- No. 79 ..... 45c.

Bortram, f.o.b. Niagara Falls
- Ton lots, per lb. ..... 45c.
- Less ton lots, per lb. ..... 50c.

Ferrocolumbium, 50-60%, contract basis, f.o.b. plant with freight allowances, per lb. contained Cb.
- 2000 lb. lots $2.25
- Under 2000 lb. lots $2.30

Ferrotitanium, 40%-45%, f.o.b. 0.10c. max. Niagara Falls, N. Y., ton lots, per lb. contained Ti.. $1.23
- Less ton lots $1.25

Ferrotitanium, 20%-25%, 0.10 C max., ton lots, per lb. contained titanium $1.35
- Less ton lots $1.40

High-carbon ferrotitanium, 15%-20%, 6%-8% carbon, contract basis, f.o.b. Niagara Falls, N. Y., freight allowed East of Mississippi River, North of Baltimore and St. Louis, per carload $142.50

Ferrophosphorus, 18% electric or blast furnaces, f.o.b. Anniston, Ala., carlots, with $3 unitage freight equaled with Rockdale, Tenn., per gross ton $58.50

Ferrophosphorus, electrolytic 23-26%, carlots, f.o.b. Monsanto (Siglo), Tenn., $3 unitage freight equalized with Nashville, per gross ton $75.00

Ferromolybdenum, 55-75%, f.o.b. Langeloth, Washington, Pa., any quantity, per lb. contained Mo. 95c.

Calcium molybdate, 40%-45%, f.o.b. Langeloth and Washington, Pa., any quantity, per lb. contained Mo ..... 80c.

Molybdenum oxide briquetes, 48%-52% Mo, f.o.b. Yangeloth, Pa., per lb. contained Mo ..... 80c.

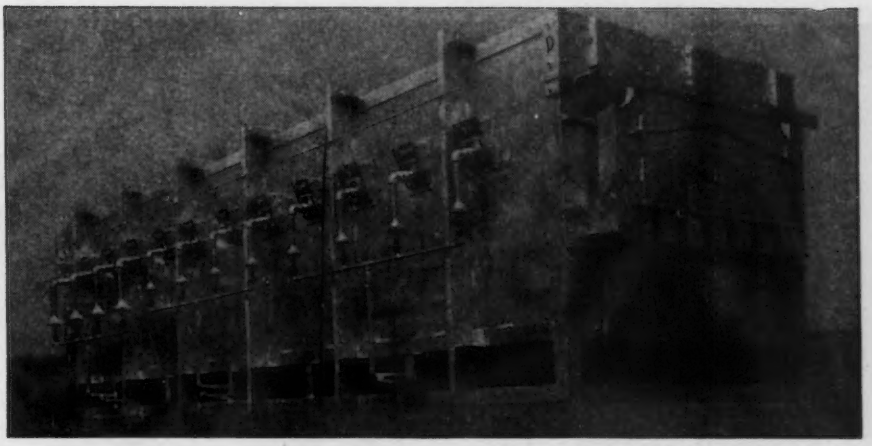
Molybdenum oxide, in cans, f.o.b. Langeloth and Washington, Pa., per lb. contained Mo ..... 80c.

Zirconium, 35-40%, contract basis, f.o.b. producer's plant with freight allowances, per lb. of alloy. Add ¼c. for spot sales
- Carload lots ..... 14c.

Zirconium, 12-15%, contract basis, lump, f.o.b. plant usual freight allowances, per lb. of alloy
- Carload, bulk ..... 4.6c.

Alsifer (approx. 20% Al, 40% Si and 40% Fe), contract basis, f.o.b. Niagara Falls, carload, bulk ..... 5.75c.
- Ton lots ..... 7.25c.

Simanal (approx. 20% Si, 20% Mn, 20% Al), contract basis, f.o.b. Philo, Ohio, with freight not to exceed St. Louis rate allowed, per lb.
- Car lots ..... 8.75c.
- Ton lots ..... 9.25c.



BELLEVUE FURNACES
are designed for the job.

In the construction of Bellevue Furnaces, painstaking consideration of the job to be done comes first. Every factor must be evaluated, every condition studied. Only then do Bellevue engineers attempt design and recommendation of furnace type.

The soundness of that policy is being demonstrated in plant after plant. Hundreds of executives in scores of varied companies have proved, to their own satisfaction, the efficiency, speed, high production level and operating economies of Bellevues that were "designed" for the job.

You, too, will find Bellevue experience and facilities a profitable investment for your own furnace needs.

Send for full details.

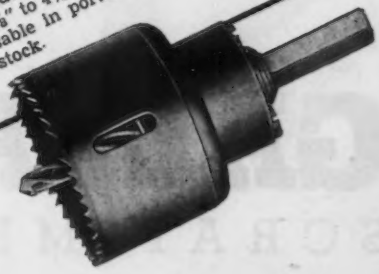
BELLEVUE INDUSTRIAL FURNACE CO.
2974 BELLEVUE AVENUE DETROIT, MICH.

Fast **Tough**

Heavy feed at high speed!

Heavy feed at high speed spells doom to the ordinary hack saw blade; down-time for your machine, extra expense in money, man hours, and production. The MARVEL Hack Saw Blade, because it is positively *unbreakable* under these conditions, should be "a must" tool in every efficiently operated shop. A tough alloy steel back is electrically welded to high speed steel teeth, producing a blade that can be pulled to almost unlimited tension; can withstand extra heavy feeds and the heat and abrasion of high speed heavy duty sawing.

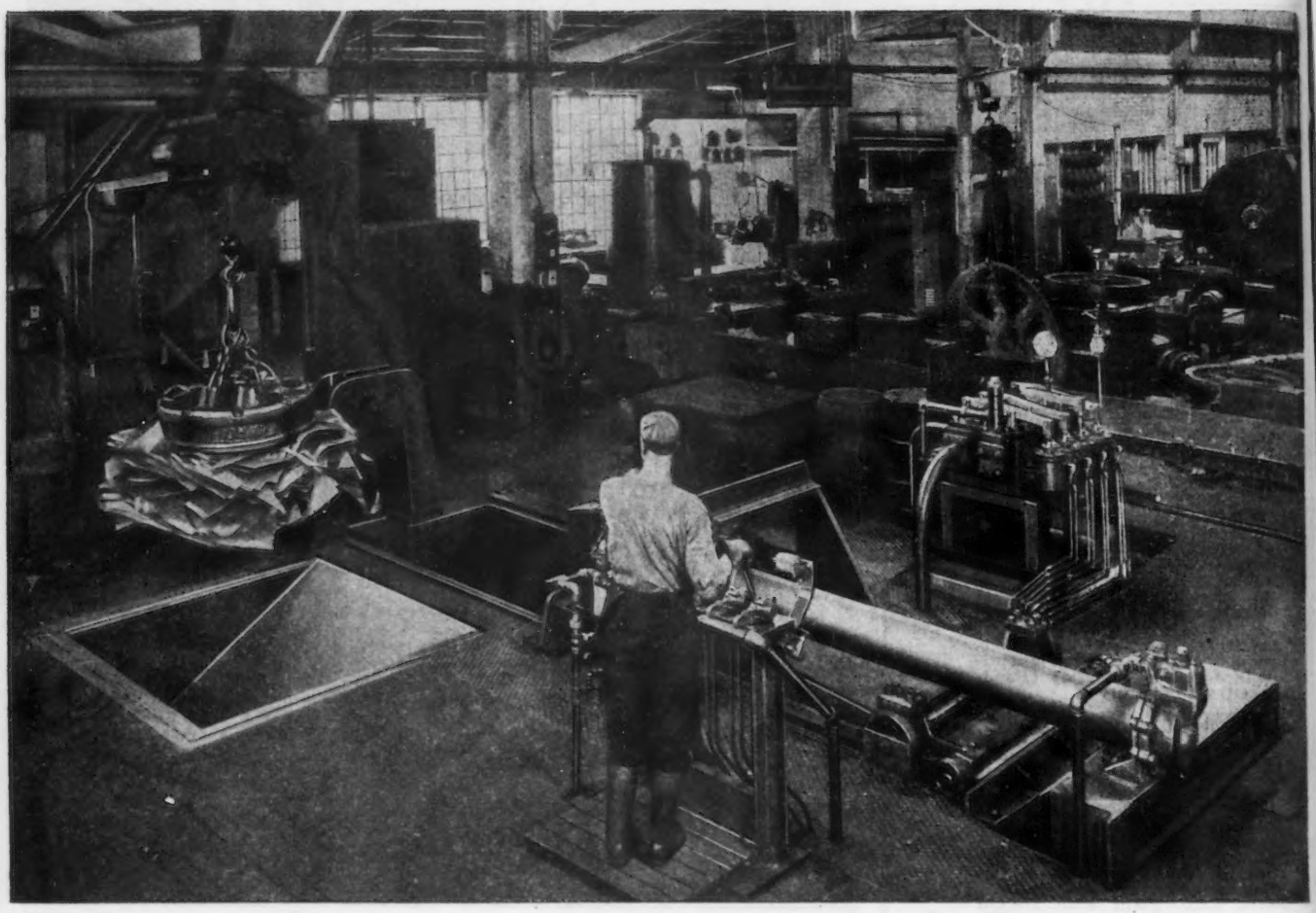
The same exclusive *unbreakable* feature of MARVEL Hack Saw Blades is also a feature of MARVEL Hole Saws, giving these saws the ability to stand up under abuse. MARVEL Hole Saws cut holes from ⅝" to 4½" diameter in stock up to 1⅛" thick. Usable in portable drill, drill press, or lathe tail stock.



Complete Range of Metal Sawing Machines

Being the largest exclusive manufacturer of metal sawing machines and blades, both hack saw and band saw type, we have the correct answer to your cut-off problems. Each MARVEL model has a distinct application, so write us and we will send our catalog, price, and recommendation for the saw to fill your requirements most efficiently. MARVEL sawing engineers are also available to discuss and analyze your cut-off work. (Without obligation of course)

ARMSTRONG-BLUM MFG. CO.
5700 W. Bloomingdale Ave., Chicago 39, Illinois, U.S.A.



GALLAND-HENNING
TRIPLE-COMPRESSION BALER
in a large eastern war plant bales Scrap-for-Victory. There's a G-H Baler for every type of industrial sheet-metal scrap, in the proper size and capacity for every need.

BALED SHEET METAL SCRAP
Pays Dividends . . . TWO WAYS!

Industries which bale their sheet metal clippings and trimmings . . . efficiently and economically, the G-H way . . . reap a dual benefit. *First,* sheet metal scrap reduced to dense, mill-sized bales always commands top prices. *Second,* baled sheet metal scrap is needed to keep the mills and smelters producing new steel at top capacity to meet today's tremendous demands.

There's a Galland-Henning Scrap Metal Baler that exactly meets your baling requirements. Call on G-H engineers for experienced counsel in connection with your scrap metal baling program.

GALLAND-HENNING MFG. CO.
2747 SOUTH 31st STREET • MILWAUKEE 7, WISCONSIN

GALLAND-HENNING
SCRAP METAL BALING PRESSES

A 4366-1P